GUIDELINES FOR PREPARING A MINING SITE REHABILITATION PLAN AND GENERAL MINING SITE REHABILITATION REQUIREMENTS

EXPLORATION

EXPLOITATION

RESTAURATION

DES SITES MINIERS

103-03497/

GUIDELINES FOR PREPARING A MINING SITE REHABILITATION PLAN AND GENERAL MINING SITE REHABILITATION REQUIREMENTS

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FOREWORD

The *Mining Act* was recently amended to ensure that land disturbed by mining activities is rehabilitated. Since March 9, 1995, any individual engaging in mining exploration or operations must submit a rehabilitation plan and a financial guarantee covering 70% of the cost of rehabilitation work on accumulation areas.

The Ministère de l'Environnement et de la Faune (MEF) and the Ministère des Ressources naturelles (MRN) jointly drafted these guidelines to inform proponents of how the rehabilitation plan is to be presented, its technical content and the general mining site rehabilitation requirements involved.

Designed to guide the mining industry, this document is divided into three parts. Part 1 deals with *Mining Act* provisions governing mineral substances, exploration and mining, details to be submitted should mining operations be temporarily shut down, and mining site rehabilitation objectives, which are based on certain site restoration requirements.

Part 2 explains what the proponent must include in the rehabilitation plan: general information, a description of mining activities and the mining site, and an outline of the rehabilitation program for exploration and mining projects. It must also describe programs for monitoring physical stability and environmental/agronomical impacts, and include information on the emergency plan, the rehabilitation plan cost estimate, and the work schedule.

Part 3 outlines the precepts for submitting the plan, information on the financial guarantee and the administrative process involved.

Finally, the appendices include physical stability requirements, the report format, the method for assessing the various rehabilitation options, measurement methods and analysis techniques, sampling requests, the list of the main statutes and regulations governing mining site rehabilitation, and a technical glossary.

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We would like to thank the Ministère des Ressources naturelles - Secteur des forêts, the Centre de recherche minérale, the Association des prospecteurs du Québec (APQ), the Association des mines d'amiante du Québec (AMAQ) and the Association minière du Québec (AMQ) for their collaboration.

NOTE

In addition to its new title, this second edition of the guidelines contains various other modifications. Substantial content-related changes have been made to the following sections:

3. General Rehabilitation Requirements

3.2 Revegetation

3.3 Contaminated Soils

3.5.1 Excavations (Bulk Sampling) and Stripping Zone

3.5.2 Excavations (Open-Pit Mine)

10.1 Restoration Cost

14.2 Amount and Payment of the Guarantee

OBJECTIVES

This document was prepared to:

1) define what is meant by restoring a site to a satisfactory condition;

2) provide proponents with information on the contents of the rehabilitation plan to be submitted to the Ministère des Ressources naturelles (MRN);

3) help proponents prepare their rehabilitation plan by providing:

   a) a list of the elements it must contain;

   b) the technical specifications for its format and presentation, and the scale of the various plans and photographs to be included;

4) simplify the administrative procedure by reducing the number of government parties proponents need to contact directly. The MRN will forward copies of the plan to the other departments for consultation. In all cases, the Ministère de l'Environnement et de la Faune (MEF) will be consulted and its recommendations taken into account.

All comments and suggestions relating to the content of this document may be directed to one of our offices:

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Warning

The legal and regulatory texts prevail over the provisions of this document.

PART 1
GENERAL INFORMATION

INTRODUCTION

The *Mining Act* was recently amended to ensure that land disturbed by mining activities is rehabilitated[1]. These new provisions do not in any way affect the provisions of the *Environment Quality Act*.

Any individual engaging in exploration or mining activities must submit, to the Ministère des Ressources naturelles (MRN), a rehabilitation plan and a financial guarantee covering 70% of the cost of rehabilitation work on accumulation areas. For the plan to be approved, the financial guarantee must be consistent with legal provisions. However, the MRN may make its approval of the plan contingent upon advance payment of all or part of the guarantee. Should the proponent fail to carry out the requirements of the rehabilitation plan, the Department may have the work performed and recover the costs incurred from the financial guarantee.

Under the *Mining Act*, the MRN may oblige an individual to carry out rehabilitation work on tailings produced by his mining activities even after the mining site has closed.

Individuals wishing to engage in mining activities must submit a rehabilitation plan before they begin.

Chapter 1, Part 1 of these guidelines outlines the amendments to the *Mining Act*. Chapter 2 discusses the measures applying when mining activities are temporarily shut down. And, Chapter 3 lists overall mining site rehabilitation objectives along with the general requirements that apply.

1. MINING ACT PROVISIONS

This chapter outlines the persons, activities and mineral substances governed by *Mining Act* provisions on mining site rehabilitation. For further information, please consult the statutes, regulations and information brochures published.

1.1 Persons Governed by the Act

The persons governed by Section 232.1 of the *Mining Act* are:

1) holders of mining rights who engage in the exploration work indicated in Table I or agree that such work be carried out on land for which they hold a mining right;

2) operators who engage in the mining activities indicated in Table I;

3) persons who operate an ore processing plant (including regional or set-price concentration plants);

4) persons who engage in mining operations using tailings.

The persons governed by Section 232.11 must respect the minimum rehabilitation requirements listed in this document.

1.2 Work Governed by the Act

Work governed by the Act is listed in sections 96.2 and 96.3 of the *Regulation respecting mineral substances other than petroleum, natural gas and brine (M-13.1, r.1)*.

Table I presents exploration and mining activities for which a rehabilitation plan must be submitted.

1. "Rehabilitation" designates all activities associated with restoring and reclaiming the mining site.

TABLE I

Exploration and Mining
Work Governed by the Act

Work	*Exploration*	*Mining*
Staking	No	-
Line cutting (geochemical and geophysical surveys)	No	-
Survey work	No	-
Movement of material	Yes, if 10 000 m^3 or more or 10 000 m^2 or more	-
Drilling, tree cutting and skidder roads (except drilling in tailings ponds)	No	-
Surface sampling	Yes, if more than 500 mt	-
Preparation of accumulation areas (waste rock piles and tailings ponds)	Yes	Yes
All underground work	Yes	Yes
Open-pit mining	-	Yes
Ore or tailings processing	-	Yes
All work done on accumulated material	Yes	Yes
Preparation of accumulation areas for foundry activities	-	Yes

1.3 Activities Not Governed by the Act but Requiring Authorization

Under Section 69 of the *Mining Act (M-13.1)*, a mining claim holder who wishes to extract between 50 and 500 metric tons of material for geological or geochemical sampling not governed by the Act may do so with MRN authorization. He must send his request to the MRN along with the documents and technical information listed in Appendix 5.

The claim holder need not submit a rehabilitation plan or financial guarantee when carrying out exploration work not governed by the Act on land zoned non-exclusively for recreation, tourism, or plant-life/wildlife conservation, or in an urban setting. However, he must carry out the rehabilitation work stipulated by the MRN under sections 34 and 213.2 of the *Mining Act*.

1.4 Substances Governed by the Act

1.4.1 Exploration

The *Mining Act* applies to all mineral substances within the public domain (belonging to the Crown). It does not apply to the private-domain mineral substances described in Section 5 of the Act.

1.4.2 Mining

The *Mining Act* applies to mining operations for all mineral substances except petroleum, natural gas, brine and surface mineral substances (except for inert tailings used in construction) *(M-13.1, r. 1, s. 96.4)* as listed in Table I.

It also applies to private-domain mineral substances, since the definition of "operator" in Section 218 does not differentiate between public or private domain deposits. Section 217 of the *Mining Act* indicates that Chapter IV, which contains the mining site rehabilitation provisions, also applies to mineral substances that are not part of the public domain.

1.5 Submitting the Plan

Under Section 232.2 of the *Mining Act*, the proponent must submit his rehabilitation plan along with a description of the financial guarantee before commencing mining activities (exploration or mining operations). To facilitate and accelerate its analysis, the rehabilitation plan should be submitted as soon as the work indicated in Table I has been planned.

The financial guarantee corresponds to 70% of the cost estimate for work required to restore accumulation areas *(M-13.1, r. 1, s. 96.5)*.

Before the rehabilitation plan can be approved, the financial guarantee must be paid as stipulated in sections 96.6 and 96.7 of the Regulation *(M-13.1, r. 1)*. However, under certain circumstances, before approving the plan, the Minister may require advance payment of the financial guarantee, in whole or in part *(M-13.1, s. 232.5)*.

1.6 Specific Provisions

As stipulated in Section 232.12, nothing in sections 232.1 to 232.11 of the *Mining Act* affects or restricts the application of the *Environment Quality Act*.

2. MEASURES APPLICABLE SHOULD MINING ACTIVITIES BE TEMPORARILY SHUT DOWN

Should mining activities be shut down for less than six months, the proponent must advise the MRN in writing of the dates they ended and recommenced.

If mining activities are shut down for six months or more, a proponent carrying out underground exploration must, under sections 224 and 226 of the *Mining Act*, advise the Ministère des Ressources naturelles and, within four months of the date activities ceased, forward certified copies of the plans for the underground structures, mining structures, surface facilities, and existing tailings sites. The proponent must also advise the MRN in writing when mining activities recommence.

The proponent is advised to contact the MRN to find out what information is required.

2.1 Exploration Sites

2.1.1 Surface Exploration

The proponent must provide a map which clearly indicates the location (on the mining site) of the various means used to restrict access and ensure safety. Where applicable, he must also describe the methods used to monitor and control effluents that will remain active when mining activities are temporarily shut down. He must submit a schedule for installing the various safety structures and for the inspections.

2.1.2 Underground Exploration

The proponent must describe the measures implemented to ensure public safety and environmental protection when mining activities are temporarily shut down. The proponent must provide a map which clearly indicates the location (on the mining site) of the various means used to restrict access to and ensure safety (barricades, fences, gates, concrete slabs, etc.). He must seal off or cover surface openings and excavations, where applicable. He must also describe the methods used to monitor and control effluents that will remain active when mining activities are temporarily shut down. He must submit a schedule for installing the various safety structures and for the inspections.

2.2 Mining Sites

The proponent must describe the measures he intends to implement to ensure public safety and environmental protection when mining activities are temporarily shut down. The document must cover:

1) the measures implemented to ensure the safety of surface openings;

2) the measures implemented to restrict access to the site, to the various buildings, and to the other structures;

3) the methods for monitoring and processing effluents in keeping with the requirements of the *Environment Quality Act*;

4) the methods used to store all types of chemical products;

5) the measures to be implemented to ensure the physical and chemical stability of the various accumulation areas and the tailings pond.

The proponent must provide an accurate map of the mining site and the various safety structures (barricades, fences, gates, concrete slabs, etc.). He must also provide a schedule for installing the various safety structures and for the inspections.

3. GENERAL REHABILITATION REQUIREMENTS

This chapter contains the general mining site rehabilitation requirements. They apply to exploration and mining sites.

Requirements may differ, depending on site characteristics. If the proponent's rehabilitation measures fail to meet the general requirements stipulated here, he must demonstrate the validity (environmental, technical, financial, etc.) of the measures he proposes.

3.1 Definition of Satisfactory Condition

The aim of rehabilitation is to restore the site to a satisfactory condition by:

1) eliminating unacceptable health hazards and ensuring public safety;

2) limiting the production and circulation of substances that could damage the receiving environment and, in the long-term, trying to eliminate maintenance and monitoring;

3) restoring the site to a condition in which it is visually acceptable to the community;

4) reclaiming the areas where infrastructures are located (excluding the accumulation areas) for future use.

3.2 Revegetation

All areas affected by mining activities (building sites, tailings ponds, sedimentation ponds, waste rock piles, etc.) must be revegetated to control erosion and restore the site's natural condition. However, if all or part of the mining site, particularly former waste rock piles, and waste rock piles in use on March 9, 1995, cannot be revegetated, the proponent must prove that it is nevertheless in "satisfactory condition".

Before revegetation, the land must be scarified and fertilized, if necessary. Where applicable, the organic soil[2] that had been piled up must be spread.

In general, grass and bushes must be planted to prevent soil erosion and to facilitate the formation of humus. The characteristics of this vegetation should resemble that of the natural environment except for the early growth (which forms the bottom layer).

Vegetation must be self-sufficient six years after planting and require no fertilizing or maintenance.

3.3 Contaminated Soils

The *contaminated land rehabilitation policy* of the Ministère de l'Environnement et de la Faune is designed to ensure that the contaminated soil is not harmful to public health or the environment, and that it is compatible with future use.

The implementation of this policy is part of a process designed to rehabilitate land contaminated by mining activities, with the exception of tailings accumulation areas and authorized waste disposal areas.

2. Unconsolidated deposits and organic soil must be stored separately for future mining site rehabilitation use. The MRN Secteur des forêts recommends that organic soil be stored in several medium-sized piles rather than one large one, and that erosion-protection measures be implemented.

Generally speaking, action is required when contamination levels exceed value B for all parameters that stand out from the natural local background concentration. Based on the following concentrations, contamination levels and objectives for action may be defined as follows:

Level <A:
- non-contaminated environment;
- no corrective action.

Range A-B:
- mildly contaminated environment;
- no corrective action (unless groundwater quality is affected).

Range B-C:
- contaminated environment;
- necessary exhaustive characterization;
- decontamination work may be necessary to meet rehabilitation objectives, particularly if the site is to be used for residential purposes;
- conceivable industrial use without decontamination.

Level >C:
- highly contaminated environment;
- exhaustive characterization required;
- mitigation work should be envisaged when mining activities cease unless the proponent can show that the site will be in satisfactory condition (Section 3.1), regardless of its future use.

The land must be characterized once mining activities have ceased in order to determine whether the resulting contaminated soils need to be rehabilitated. This characterization must:

a) determine the contamination level;

b) find the precise location of the contamination and determine whether and where it is spreading;

c) determine the volume of each type of contaminant.

For current mining operations, an estimate or preliminary soil quality assessment is needed to determine whether the soil is contaminated and, where applicable, to define the scope of the rehabilitation work required.

The management practice for contaminated excavated soil is contained in the document *Les lignes directrices pour le traitement de sols par biodégradation, bioventilation ou volatilisation (Ref. No. 17)*. However, when the level and nature of contaminants are the same as those in the tailings pond, they may be disposed of therein as long as there is no danger to the environment.

3.4 Buildings and Surface Infrastructures

All buildings and surface infrastructures must be dismantled unless the proponent can show that they are necessary to achieve and maintain the satisfactory condition or to support the area's socioeconomic development.

3.4.1 Administrative Buildings and Accommodation

Walls must be razed to the ground; foundations may remain only if they are covered with mineral substances that permit the growth of self-sufficient vegetation (Section 3.2).

Under the MEF's *Regulation respecting solid waste* (Section 3.13) waste from dismantling must be removed from the site and stored in a MEF authorized waste disposal site.

3.4.2 Shaft, Service Buildings and Processing Plant

The same requirements as those listed in Section 3.4.1 apply. The proponent must also assess the quality of the subsoil and, if need be, decontaminate it (Section 3.3).

3.4.3 Support Infrastructures[3]

All underground support infrastructures (tanks, tank pipes, other pipes, underground services, etc.) may, depending on the future use of the mining site (residential, industrial, recreational, tourism, forest operations, etc.), remain or unearthed and removed from the site.

The remaining openings and support infrastructure accesses must be sealed off. The proponent must provide a plan showing the location of these support infrastructures.

3. Tanks and pipes used to store and transport hazardous materials of all sorts are excluded (Refer to sections 3.11 and 3.12 of this document).
All support structures on the surface (buildings, tanks, various pipes, etc.) must be dismantled and removed from the site.

Disposal of these infrastructures must comply with the MEF's *Regulation respecting solid waste* (Section 3.13). The proponent must provide a quality

assessment of the subsoil and if need be, decontaminate it (Section 3.3).

3.4.4 Transportation Infrastructures

Before closing down access roads, the proponent must check to see whether the Secteur des Forêts (MRN) wishes to maintain them. The main mining site access road must be kept in good condition along with secondary roads used to monitor and maintain mining site structures.

Where roads are no longer necessary (including railways), the site must be restored as follows:

a) bridges, culverts and pipes must be removed and ditches filled in, when no longer required;

b) natural stream flows must be restored and stream/river banks and ditches stabilized by planting vegetation. However, if vegetation cannot be maintained (substantial threat of erosion), granular material or riprap may be used;

c) road surfaces, shoulders, escarpments, steep slopes, regular and irregular benches, etc. must be rehabilitated in order to prevent erosion;

d) in general, road surfaces and shoulders must be scarified, levelled and revegetated as stipulated in Section 3.2.

Mining site runways may be left intact (along with all related infrastructures) if they are in good condition and are environmentally benign. Otherwise, all infrastructures (bridges, etc.) must be dismantled, stream flows restored and the runway surface scarified and revegetated as stipulated in Section 3.2.

3.4.5 Equipment and Electrical Infrastructures

The equipment and electrical infrastructures (pylons, electrical cables, transformers, etc.) on-site belonging to the proponent must be dismantled. However, electrical equipment required to monitor and maintain installations may remain operational. The measures implemented to prevent site contamination must be maintained.

The proponent must provide a quality assessment of the soils near electrical stations with facilities containing oil or petroleum products and decontaminate them if need be (Section 3.3).

3.4.6 Surface Equipment and Heavy Machinery

Mining equipment (hoists, pumps, conveyors, etc.), ore processing equipment (grinding mill, flotation cells, cyanidation tanks, thickeners, etc.) and heavy machinery (motor vehicles, drills, shovels, etc.) must be removed from the site after the proponent has checked to determine whether they are contaminated. If necessary, he will have to manage the equipment according to MEF regulations (sections 3.12 and 3.13).

During rehabilitation, the proponent must pay particular attention to equipment areas, evaluate the quality of the subsoils and, if need be, decontaminate them (Section 3.3).

3.4.7 Equipment, Heavy Machinery and Underground Infrastructures

Mining equipment (conveyors, jackleg drills, etc.) and heavy machinery (trains, motor vehicles, drills, etc.) must be removed from the site after the proponent has checked to determine whether they are contaminated. If necessary, he will have to manage the equipment according to MEF regulations (sections 3.12 and 3.13).

If it is technically and economically feasible to do so, underground infrastructures (crushers, rails, metal crusher room structures, water pipes, air and compressed air pipes, etc.) and equipment (fans, pumps, etc.) must be removed from the site.

During rehabilitation, the proponent must pay particular attention to equipment, heavy machinery and underground infrastructure areas, try to detect any trace of potential hydrocarbon contamination and, if applicable, take remedial action.

Petroleum product tanks of all sorts must be removed from the site as stipulated in the *Petroleum Products Regulation* (Section 3.11).

3.5 Underground and Open-Pit Work

This section deals with: underground mines, open-pit excavations, and bulk sampling sites.

3.5.1 Excavations (bulk sampling) and stripping zone

Excavations and stripping zones must be backfilled. However, excavations may not be need to be backfilled if the resident geologist confirms in writing, at the proponent's request, that the excavation constitutes an essential attraction of the geological heritage to be conserved and that it does not constitute a danger to public safety. In this case, a fence meeting MRN regulatory standards *(M-13.1, r. 1, Chapter X)* must be built. In certain cases, an embankment with a ditch in front may be acceptable. The embankment must be two meters high and have an equivalent crest line. It must be made of unconsolidated materials or inert mineral substances. If applicable, it must have a ditch (minimum 2 m wide and 1 m deep) in front of it.

The entire wooded surface between the gate (fence or embankment) and the excavation should be thinned (cut understorey) and cleaned.

Signs should be posted on the gate at reasonable intervals to ensure that it is well visible.

3.5.2 Excavations (open-pit mine)

If it is technically and economically feasible to do so, excavations must be backfilled. Otherwise, all access roads must be condemned and a fence meeting MRN regulatory standards *(M-13.1, r. 1, Chapter X)* must be built. In certain cases, an embankment with a ditch in front may be acceptable. The embankment must be two meters high and have an equivalent crest line. It must be made of unconsolidated materials or inert mineral substances. If applicable, it must have a ditch (minimum 2 m wide and 1 m deep) in front of it.

The gate (fence or embankment) should be at least fifteen (15) meters from the excavation (horizontal distance) or more if geotechnical considerations so warrant. The entire wooded surface between the gate (fence or embankment) and the excavation should be thinned (cut understorey) and cleaned.

Signs should be posted on the gate at reasonable intervals to ensure that it is well visible.

NOTE: For cases involving backfilling of an open-pit mine, it is recommended that the proponent check with the MRN beforehand to determine whether the material used (solid waste, waste rock, etc.) is acceptable.

3.5.3 Safety of Surface Openings

All surface openings must be sealed off as stipulated in the *Regulation respecting mineral substances other than petroleum, natural gas and brine (M-13.1, r.1, Chapter X).*

Underground worksites with surface openings, should be backfilled and levelled to blend in with the surrounding topography. If this option is not technically or economically feasible, a fence respecting MRN regulatory standards must be built.

NOTE: When backfilling an underground worksite with surface openings, it is recommended that the proponent check with the MRN beforehand to determine whether the material used (solid waste, waste rock, etc.) is acceptable.

3.5.4 Stability of Surface Pillars

The pillar must ensure long-term structural stability after mining activities cease. It must sustain its own weight and, if applicable, the weight of unconsolidated deposits, watersheds and all other surface loads.

No sudden rupture of the chimney must occur. Otherwise, if a chimney is formed, it must be stopped and filled up before reaching the surface. Stability calculations must be consistent with current standards.

For underground mining sites, for which the long-term stability of the pillars cannot be guaranteed, a fence meeting MRN regulatory standards must be built around the problem area.

3.6 Mine Dewatering Ponds

Mine dewatering ponds must be restored unless the proponent can prove that they serve a purpose. Pond dikes must be levelled and the site revegetated as stipulated in Section 3.2.

Treatment sludge[4] must be stored in the tailings pond or, in the absence thereof, disposed of in keeping with MEF requirements.

3.7 Waste Rock Piles

Waste rock piles must be stable in the long term to prevent erosion, subsidence or collapse. The generation of acid water and other contaminants must be controlled to meet the mining effluents standards stipulated in Section 3.9.

Aesthetics must be taken into consideration in rehabilitation work planning.

3.7.1 Physical Stability

Waste rock pile slope stability criteria are stipulated in Appendix 1.

3.7.2 Waste Generating Acid Mine Drainage

Waste rock pile rehabilitation must allow the chemical reactions generating acid water to be controlled at the source, prevent contaminated water flows, and allow contaminated water to be collected and treated. In all cases, mining effluents must meet the requirements of Section 3.9.

Use of effluent-treatment facilities (including diversion and collection ditches) does not constitute rehabilitation, but a temporary measure to be used while striving to meet MEF standards or develop technically and economically viable rehabilitation methods.

If they do not yet exist, collection systems must be implemented to recover contaminated percolation waters and diversion of uncontaminated runoff. They must require minimal maintenance and meet the requirements of Appendix 1.

4. Sludge from mining operations and ore processing is considered tailings under the *Mining Act* (M-13.1, s. 1).

3.8 Tailings and Sedimentation Ponds

Tailings and sedimentation pond containment structures must not deteriorate, erode or collapse under wind/water, frost/thaw, human activity, or annual ice build-up, or due to root damage, beaver dams, animal burrows, earthquakes, etc.

3.8.1 Physical Stability

Tailing pond containment structures must remain stable and meet the criteria stipulated in Appendix 1, even if no tailings are added.

3.8.2 Chemical Stability of Materials

Using proven techniques, tailings and sedimentation pond rehabilitation must allow the production of all types of contaminants (including chemical reactions generating acid waters) to be controlled directly, prevent contaminant flows, and ensure contaminant collection and treatment. In all cases, mining effluents must meet the requirements of Section 3.9.

Use of effluent-treatment facilities (including diversion and collection ditches) does not constitute rehabilitation, but a temporary measure to be used while striving to meet MEF standards or develop technically and economically viable rehabilitation methods.

3.8.3 Water Collection Systems

Collection systems must be implemented to recover contaminated percolation waters and divert uncontaminated runoff. These systems must require minimal maintenance.

To promote tailings pond overflow drainage, drainage culverts and ballasting spillways are recommended. Decant towers (and other similar systems) are not acceptable unless they can be justified. If they can, special measures must be implemented to ensure their maintenance and safety.

Water collection system dams must meet the physical stability requirements of Appendix 1.

3.9 Mining Effluents

Mining effluents must meet MEF requirements at all times.

3.10 Sanitary Installations

After being emptied out, all decommissioned septic tanks must be filled with gravel, sand, earth or inert material as stipulated in the *Regulation respecting waste water disposal systems for isolated dwellings (Q-2, r.8, s.16).* Purification field treatment ponds need not be removed. Wastewater treatment ponds (domestic waste) must be emptied and backfilled so as not to create stagnant water ponds.

The sludge collected may be used as organic fertilizer, but requires a MEF certificate of authorization. It may be disposed of in a sanitary landfill site once dehydrated, or in another MEF-authorized site.

Any other wastewater treatment equipment (biodisks, etc.) must be removed. If the proponent does not intend to use it again, it must be disposed of in keeping with solid waste management requirements (Section 3.13).

3.11 Petroleum Products

The *Petroleum Products Regulation (U-1.1, r.1)* contains measures targeting the rehabilitation of petroleum product storage sites. It includes any hydrocarbon mix used as fuel (gasoline, diesel), fossil fuel (light or heavy heating oil) or a lubricant (new/used oils, grease). However, it does not apply to motor vehicle tanks or the following equipment used for non-commercial purposes: movable 225-litre-or-less fuel tanks or 4000-litre-or-less heating oil tanks.

After two full years of abandonment, all storage facility parts (underground or surface tanks and pipes) must be dismantled by qualified installers, and the site decontaminated according to MEF requirements.

Les lignes directrices d'intervention lors de l'enlèvement de réservoirs souterrains ayant contenu des produits pétroliers, published in August 1994 by the Ministère de l'Environnment et de la Faune (Ref. No. 18) provide a detailed description of the procedure and elements involved in characterizing and decontaminating sites contaminated by petroleum products, and in managing excavated soils and recovered waters.

3.12 Hazardous Waste

Hazardous waste management is governed by the *Hazardous Waste Regulation (Q-2, r. 3.01).* Schedule I of the Regulation lists a series of hazardous products, and Schedule II provides a decision tree classifying waste.

Note: Mine tailings are not considered hazardous waste under the *Environment Quality Act.*

The hazardous waste most commonly associated with the mining industry is: used oil and grease, used solvents, contaminated containers or materials, obsolete products and PCB-contaminated oils and equipment *(Q-2, r.3.01, s. 3-5).*

All hazardous waste must be removed from the mining site after activities are permanently shut down. However, on-site storage according to MEF requirements may be authorized if no other disposal or treatment technology exists.

Used oil can be sent to a waste transfer centre or an authorized recycling/re-use site. Waste transportation from a producer of used oil to an authorized site located in Québec *(Q-2, r. 3.01, s. 100, Division VI)* requires a transport permit but not a shipping manifest.

Other hazardous waste must be sent to an authorized hazardous waste disposal site, treatment site, recycling site or re-use site. The carrier requires a transport permit *(Q-2, r. 3.01, Division IV)* and a shipping manifest *(Q-2, r. 3.01, Division V).*

PCB-contaminated oils and equipment (concentration less than 50 ppm) may be transported to a MEF-authorized disposal site. Currently, there is no authorized disposal area in Québec for higher concentrations. However, there are mobile treatment units that can decontaminate and reduce PCB concentrations. If despite treatment, concentrations remain higher than 50 ppm, the oils and equipment must be stored as stipulated in the Regulation *(Q-2, r. 3.01, Division III)* until appropriate disposal technology is available.

3.13 Solid Waste

Solid waste management and disposal is governed by the *Regulation respecting solid waste (Q-2, r. 3.2)* of the *Environment Quality Act.*

The definition of solid waste under the *Regulation respecting solid waste (Q-2, r. 3.2, s. 1e)* excludes motor vehicle chassis, oil-soaked sand, tailings, sludge and hazardous waste *(Regulation respecting hazardous waste ; Q-2, r. 3.01).* Waste from industrial processing containing higher-than-standard levels of contaminants *(Q-2, r. 3.2, s. 30)* is not considered solid waste.

Solid waste can be sent to:

1) a MEF-authorized landfill site or in-trench disposal site in the nearest municipality;

2) a dry material disposal site authorized specifically for the mining site *(Q-2, r. 3.2, Division IX)*. Only non-fermentable materials *(Q-2, r. 3.2, s. 1n)* and materials from excavation backfilling *(Q-2, r. 3.2, s. 85)* may be disposed of in this site. The proponent must obtain a MEF certificate of conformity and an operating permit requiring a $25 000 deposit;

3) an in-trench solid waste disposal site authorized specifically for the mining site in keeping with the *Regulation respecting solid waste (Q-2, r. 3.2, Division X)*;

4) in specific cases *(Q-2, r. 3.2, s. 133)* solid waste disposal may be authorized for other sites under Section 13 of the *Regulation respecting the administration of the Environment Quality Act (Q-2, r. 1.001)*;

5) north of the 55th parallel, solid waste may be disposed of in a Northern waste disposal site *(Q-2, r. 3.2, Division X.1)*.

NOTE: It is generally prohibited to burn waste in the open even if it has been partly recovered. Exceptions are: branches, dead leaves, explosives and empty explosives containers. Burning is compulsory for Northern waste disposal sites and is tolerated for in-trench disposal sites insofar as the smoke does not cause any environmental damage *(Q-2, r. 20, s. 22)*.

Since June 14, 1993, (E-13.1, sections 1 and 2), all sanitary landfill site and dry material disposal site creation requests must be drafted as stipulated in *the environmental impact assessment and review procedure (Q-2, Division IV.1)*.

3.14 Sand and Gravel Pits

A MEF certificate of authorization is required to open a sand and gravel pit. The site must be chosen in accordance with the siting standards stipulated in the *Regulation respecting pits and quarries, (Q-2, r.2.)*.

Division VII of this Regulation contains a description of rehabilitation measures to be implemented when mining of surface mineral substances ceases (*Division VII, sections 35 to 52*). These measures target the rehabilitation of areas where these substances were mined, i.e. the surface of the ground where aggregates were extracted, milled, sieved, loaded or stored (*Q-2, r.2, s.1b*).

PART 2
PLAN CONTENTS

INTRODUCTION

Part 2 outlines the technical and financial information to be included in the rehabilitation plan, and comprises six chapters. Chapter 4 details the areas to be covered by a mining right holder who performs or contracts out exploration on his property or by an operator drafting a rehabilitation plan. Chapter 5 deals with general information pertaining to all mining activity. Chapters 6 and 7 describe the mining site and the rehabilitation plan for the areas disturbed by exploration and mining. Chapter 8 and 9 provide information on the emergency plan and the monitoring program. Chapter 10 addresses considerations of an economic and temporal nature.

The proponent must follow the administrative procedures discussed in Part 3 and provide a financial guarantee as indicated in Chapter 14. He must also draft the rehabilitation plan report in keeping with the standards outlined in Appendix 2.

Where applicable, the proponent may refer to documents sent to support his certificate of authorization application(s) under the *Environment Quality Act (Q-2, r.2)*. Government authorities reserve the right to request additional or more recent information.

4. REHABILITATION PLAN CONTENT

In the preliminary version of the rehabilitation plan, the proponent must describe the scope of the mining activities. Site rehabilitation details may be supplied as activities progress and the plan is reviewed. The nature of the document will likely change between the design stage and the plans/specifications stage. The minister may request any information, study or additional research he deems necessary to approve the plan *(M-13.1, s. 232.5)*.

4.1 Exploration

Under Section 232.1, paragraph 1 of the *Mining Act*, a mining rights holder who carries out or agrees to the exploration activities listed in Section 96.2 of the Regulation on the property for which he holds the mining right, must submit a rehabilitation plan containing the following information:

Section 2: Measures Applicable Should Mining Operations be Temporarily Shut Down

- Section 2.1: Exploration Sites

Section 5: General Information

Section 6: Exploration

- Section 6.1: Mining Site Description
- Section 6.2: Site Rehabilitation Program

Section 8: Emergency Plan (for underground mining)

Section 9: Monitoring Program (for underground mining)

Section 10: Considerations of an Economic and Temporal Nature

The rehabilitation plan must be submitted with a description of the guarantee, or the guarantee itself, in a separate envelope marked "**CONFIDENTIAL**".

The rehabilitation plan and the financial guarantee must be forwarded in keeping with the terms stipulated in Chapter 11, Part 3 of this document "Administrative process".

4.2 Mining Activities

Under Section 232.1, paragraphs 2 to 4 of the *Mining Act*, an operator who carries out any of the mining activities listed in Section 96.3 of the Regulation must submit a rehabilitation plan containing the following information:

Section 2: Measures Applicable Should Mining Activities be Temporarily Shut Down

- Section 2.2: Mining Sites

Section 5: General Information

Section 7: Mining Activities

- Section 7.1: Mining Site Description
- Section 7.2: Site Rehabilitation Program

Section 8: Emergency Plan

Section 9: Monitoring Program

Section 10: Considerations of an Economic and Temporal Nature

The rehabilitation plan must be submitted with a description of the guarantee, or the guarantee itself, in a separate envelope marked "**CONFIDENTIAL**".

The rehabilitation plan and the financial guarantee must be forwarded in keeping with the terms stipulated in Chapter 11, Part 3 of this document "Administrative process".

5. GENERAL INFORMATION

5.1 Rehabilitation Plan Summary

The proponent must briefly describe the rehabilitation work proposed, target objectives, work schedule and estimated cost of the work required to restore accumulation areas.

5.2 Proponent and Technical Advisers

The name and address of the proponent and the technical advisers (individuals, companies, role in plan drafting) must be provided. A copy of the resolution of the Board of Directors or any other administrative entity authorizing the proponent to submit the plan must be included.

The proponent must also transmit the name and address of mining site supervisors when mining operations are temporarily shut down and when rehabilitation work is performed until the MRN releases him from these obligations. ***The MRN must be advised of any change of supervisors within 60 days.***

5.3 Site Location

The proponent must provide a map situating the mining site where rehabilitation work is taking or will take place, and indicating surrounding municipalities, zoning, UTM coordinates, townships, seigneuries, physiographic indicators and coordinates for the four corners of the plan *(M-13.1, r. 1, s. 77)*.

The proponent must also submit a claim map showing the mining property and the rehabilitation site using MRN coordinates (lot, claim, lease, mining concession number, etc.).

For exploration governed by the Act, the proponent must describe or indicate on a sketch the roads accessing the work site.

5.4 Previous Activity

The proponent must review all available information and present an overview of the site's mining history, highlighting areas which might have been contaminated by previous mining activities and the types of contaminants that might be found there. This logical characterization of the mining site will ensure that a maximum of information on site contamination is gathered. Visual documents (maps, plans, photos, videos, etc.) may be used to facilitate location and definition of contaminated or potentially contaminated areas.

5.5 Mining Activities and Economic Repercussions

The proponent must briefly describe the type of mining activity (exploration, mining, ore and/or tailing processing) he is engaged in or planning and the nature of the deposit (precious metal, base metal, industrial mineral, etc.). He must also list its overall repercussions (anticipated investments, job creation, regional and local repercussions).

5.6 Description of the Environment

The report must briefly describe the receiving environment (mining site and surrounding elements): air, water, ground, biological and human environment. If some of this information was submitted to the MEF for the certificate of authorization application, a summary with reference to this document will suffice. However, if some of the elements have changed significantly, an update is required.

5.7 Various Authorizations

The report must contain copies of the various attestations, authorization and conformity certificates or any other government (provincial, federal, regional (RCM) and municipal) or surface owner authorization. The proponent need simply list the subject and date of issue of MRN or MEF authorizations.

6. EXPLORATION

This chapter is intended for mining right holders *(M-13.1, s. 232.1, p. 1)* who carry out or agree to having exploration work carried out on their property. It targets only mining exploration projects mentioned in Section 96.2 of the *Regulation respecting mineral substances, other than petroleum, natural gas and brine (M-13.1, r. 1)*. The proponent must describe current and planned activities (underground and surface) in sufficient detail to allow their scope to be assessed. While this information may not be available when the plan is drafted, it should be supplied as it is being reviewed. The minister may request any information, study or additional research he deems necessary to approve the plan *(M-13.1, s. 232.5)*.

6.1 Mining Site Description

6.1.1 General Description

The general description must contain the following:

a) a general plan of the installations on the exploration site;

b) the type of work (drilling, surface sampling, mine shafts, etc.) carried out. For underground exploration using an access ramp, the proponent must briefly describe the underground infrastructures and surface openings. If operations are carried out via existing surface openings (e.g. an old mine), the proponent must describe them and indicate their location on the map;

c) the buildings and surface infrastructures needed for the mining activity;

d) siting, type and size of the mining camp, if applicable;

e) activities governed by the *Regulation respecting standards of forest management for forests in the public domain* adopted under section 171 of the *Forest Act* and requiring a permit: technical data on site deforestation, i.e. deforested areas, cutting limits, openings on water bodies, spillways, bridges, ditches, deckings and finally any pertinent information calling for action in the forest setting.

The MRN - Secteur des forêts has published two guides for proponents: *Guide d'intervention en milieu forestier (Ref. No. 20)* and *L'exploration minière et la forêt (Ref. No. 19)*. These documents are available in all Secteur des forêts management unit offices;

f) the anticipated period of activity and the main exploration work schedule.

6.1.2 Geology and Mineralogy

The proponent must briefly describe the following:

a) types of mineralization, mineral concentration and ore zone;

b) minerals in the host rock and their concentration;

c) analysis of ore and host rock acid-generating potential for sites with mined materials containing sulfides. The analysis must be done using the measurement methods and techniques indicated in Appendix 3;

d) composition and thickness of the surface pillars for exploration work done from existing adits and openings (e.g. an old mine) and all pertinent structural data required to evaluate their stability (including plans, and longitudinal and cross sections, where applicable).

6.1.3 Water Management

The proponent must include the description and siting of water management structures (dams, collection and diversion ditches, sedimentation ponds, pumphouses, sanitary facilities, etc.).

6.1.4 Ore Stockpiles and Waste Rock Piles

The proponent must provide the following information:

a) a plan of the site's current topography;

b) a geological study of surface deposits and the bedrock;

c) site selection criteria and accumulation area design criteria (including plans, plan and longitudinal and cross sections, where applicable);

d) volume and tonnage of materials stored or to be stored (current data and estimates throughout exploration);

e) if the ore stockpiles or waste rock piles generate acid mining drainage waters, water management methods used inside and around them;

f) where applicable, effluent monitoring methods.

6.1.5 Other Areas Used

Where applicable, the proponent must indicate the location of other property on the plan and briefly describe its contamination status.

When the mining site is shut down, the proponent must assess soil quality of the areas where ore or waste rock was transferred, hoist sites, scrap metal sites, garages, etc. to determine which contaminants they might contain.

6.1.6 Chemical Products

For all chemical reagents used in exploration work (explosives, petroleum products, etc.) and for all other chemicals used on an industrial scale, the report must include:

a) list of chemical products;

b) storage site location and characteristics;

c) type of soil underlying storage site;

d) storage methods;

e) disposal method(s), where applicable.

6.1.7 Solid Waste

If wood scraps, scrap metal and domestic waste are disposed of on the mining site, the proponent must briefly describe the characteristics of the disposal area. Otherwise, he need simply indicate where this waste will be disposed of (coordinates of the disposal site(s) used) and the name of the firm mandated to perform the work, where applicable.

6.1.8 Hazardous Waste

The proponent must describe the hazardous waste (used oils, oils containing PCBs, etc.) management method, and indicate whether this waste will be stored on the mining site. If so, he must provide the information indicated in Section 6.1.6.

6.2 Site Rehabilitation Program

The report must contain a description of the rehabilitation work envisaged once mining operations have shut down.

6.2.1 Site Safety

The report must contain the following:

a) a description of the safety measures implemented to prevent access to surface openings and excavations;

b) for exploration work done from old mine adits or surface openings, the document must, based on the information indicated in Section 6.1.2d, assess the long-term stability of each surface pillar, indicating the assessment method used and, where applicable, the means used to sustain and consolidate surface pillars.

6.2.2 Bulk Sampling Site (Surface)

For surface sampling, the proponent must indicate the measures he intends to implement to restore work areas (excavation sites, stripping area, area where unconsolidated deposits were moved, etc.).

6.2.3 Waste Rock

The proponent must give a complete and detailed description of all rehabilitation work planned for the waste rock. The description must contain:

a) physical stability studies (See Appendix 1);

b) if the waste rock generates acid mining drainage, the type of cover, its elements (unconsolidated deposits, topsoil, vegetation, etc.), thickness and a physical characterization of the materials used in rehabilitation (plus a chemical characterization when tailings are used).

6.2.4 *Buildings and Surface Infrastructures*

The report must describe the methods used to dismantle and dispose of buildings (structures and foundations of administrative and accommodation buildings, service buildings, the shaft-house, etc.), support facilities and infrastructures (electrical transmission lines, gas pipes, water supply pipes, sewer and drinking water systems, telephone cables, underground tanks, etc.), transportation infrastructures (roads, bridges, culverts, ditches, etc.), electrical equipment and infrastructures (pylons, electrical cables, transformers, etc.) and how adjacent land will be restored, where applicable.

The proponent must provide a list of the main elements to be removed from the site. He must include a plan showing the location of all buildings, support facilities and infrastructures, electrical equipment and infrastructures and transportation infrastructures to be removed or left in place.

6.2.5 *Equipment and Heavy Machinery*

The proponent must draw up a list of the main equipment and heavy machinery and explain how he will dispose of it.

6.2.6 *Water Management*

Water management infrastructures include dams, collection and diversion ditches, culverts, pipelines, sedimentation ponds, pumphouses, etc.

The report must include:

a) a topographic plan showing the location of structures used before, during (including infrastructures used temporarily during rehabilitation) and after site shutdown;

b) a detailed description of the infrastructures the proponent intends to keep on the site after shutdown (storage and flood capacity, maintenance and operation requirements, physical and chemical stability including acid mine drainage generating potential for structures composed of mining waste);

c) a description of site rehabilitation work on infrastructures which the proponent feels will no longer be needed after operations are shut down;

d) rehabilitation plans for sanitary facilities infrastructures.

6.2.7 *Petroleum Products, Chemical Products, Solid Waste, Hazardous Waste, Contaminated Soils and Contaminated Materials*

The report must assess the quantities of each element involved and describe the management methods envisaged when mining operations have shut down. Justification must be provided for materials that are to remain on-site and storage conditions must be described in detail.

7. MINING ACTIVITIES

The report must describe current and planned mining activities in sufficient detail to allow their scope to be assessed. While some information may not be available when the plan is drafted, it should be supplied as it is being reviewed. The minister may request any information, study or additional research he deems necessary to approve the plan *(M-13.1, s. 232.5)*.

7.1 Mining Site Description

The proponent must describe mining activities, ore processing and, where applicable, tailings processing. The information provided must constitute an overview of the current condition of the site and the scope of the mining activities.

7.1.1 *Description of Current and Future Activities*

The proponent must describe mining activities using known statistical mining and ore processing data along with estimates.

The description must include:

a) the average rate (metric tons/day) of ore mined, waste rock mined, ore processed and tailings produced;

b) the expected mine life, proven and probable ore reserves with cutoff grade;

c) the tonnage and volume of the unconsolidated deposits of overburden and topsoil stored, or to

be stored, during mining and until operations are shut down;

d) the tonnage and volume of tailings and waste rock placed and to be placed in surface impoundments on accumulation areas until operations are shut down;

e) the tonnage and volume of tailings and waste rock used and to be used as underground backfill until operations are shut down;

f) the surface area of the mining site and of the various accumulation areas for the materials mentioned in paragraphs c) and d).

Where mining operations have not yet begun, the report must include the work schedule for preparing the deposit and for starting operations. He must also describe all forestation activities involved (See Section 6.1.1, paragraph e).

7.1.2 Geology and Mineralogy

The proponent must briefly describe the following:

a) types of mineralization, mineral concentration and ore zone in order to determine proven and probable ore reserves[5];

b) minerals in the host rock and their concentration;

c) analysis of ore and host rock acid-generating potential for sites with mined materials containing sulfides. The analysis must be done using the measurement methods and techniques indicated in Appendix 3;

d) pertinent geological structural data in order to evaluate the stability of the surface pillars, i.e.:

- pillar history, register and monitoring program, location and description of boreholes (exploration and geomechanical);
- type of bedrock cover (thickness of overburden, depth to water table, height and weight of water column for mining under a lake);
- geological description of the structures and weaknesses (faults, joints, clay content, schistosity, dip, etc.);
- studies conducted on the surface pillar;
- bedrock shearing studies and fracturing of the rock mass after mining, horizontal and vertical constraint measures, etc.

7.1.3 Mining Methods

For underground mines (current operations, mining of a new deposit, reactivation of an old mine), the report should briefly describe the underground infrastructures, the mining method (mentioning if there is backfilling with tailings), openings and their location, surface pillars (length, width, height, including cross sections and longitudinal sections, on a surface plan of the last worksite opening), roof type and vein wall support, roof shape and, where applicable, type of backfill used and distance between the backfill and the roof of the stope.

For open pit mining, the description of the infrastructures must contain the characteristics of the benches and access roads to the pit, the angle of the slopes, the height of the benches, etc. It must also include the open pit's longitudinal cross and surface sections.

For an active mine, the surface plans, and longitudinal and cross sections of underground opening must be submitted annually to the MRN under the *Mining Act (M-13.1, s. 222 to 225).*

7.1.4 Buildings and Surface Infrastructures

7.1.4.1 Buildings and Mining Infrastructures

The report must describe the various infrastructures and components (foundations, structures, linings and dimensions) of the crushing units, ore transport units (conveyors) and hoists (shafthouse). It must also include plans showing their location.

7.1.4.2 Ore Processing Plant and Related Buildings

5. If the proponent recently applied for a mining lease from the MRN, he may refer to the geological report submitted to support his application.

The report must describe the infrastructures and components (foundations, structures, linings and dimensions) of the processing plant along with an overview of plant installations and components.

The proponent must submit a short description of the plant's operations. He must also provide a plan showing a process diagram and the main operation data, i.e. complete ore grinding particle size distribution, reagents used, tailings production (metric ton/day).

7.1.4.3 Electrical, Transportation and Support Infrastructures

The proponent must submit a plan showing the siting and arrangement of all infrastructures (buildings, roads, electrical transmission lines, railways, water and gas pipelines, waterworks and sewer systems, electrical and telephone cables, tanks, bridges, culverts, etc.). He must also provide a brief description of their dimensions and composition (component materials).

7.1.5 Water Management

The report must describe the following:

a) surface hydrological system (rivers, lakes, brooks, etc.);

b) watershed demarcation;

c) flow rate (volume/time) at the various outlets;

d) hydrology and groundwater quality assessment, with particular attention on waste rock piles that generate acid mining drainage, the acid mining drainage basin, and the tailings pond including the sedimentation pond;

e) location of management structures for runoff and water that could be contaminated (dams, collection and diversion ditches, spillways, sedimentation ponds, pumphouses, etc.). This information may be accompanied by a development plan of an appropriate scale;

f) if wastes are potential acid-generating effluent: accumulation area water balance, wate management systems around and in the accumulation area and acid control methods planned for normal mining activities. If the bedrock is alterable, the proponent must assess mineral hydratation;

g) water balance of the ore processing plant: nature and volume of inlets (mine waters, recirculated waters from the tailings pond, freshwater, etc.) and outlets;

h) water balance of the tailings and sedimentation ponds: nature and volume of the inlets (mine waters, tailing waters, precipitation, etc.) and outlets (percolation losses through dams, evaporation, final effluent flows, etc.);

i) sanitary facilities including equipment and infrastructures required to collect, evacuate and treat domestic wastewater (septic tanks, purification ponds, etc.).

7.1.6 Wastewater Treatment Site

The description of the wastewater treatment systems must contain the following elements:

a) a description of the wastewater treatment processes (with a diagram of the treatment circuit);

b) maintenance and operation requirements;

c) treatment capacity (daily or annual) and utilization period;

d) for sludge:

- production rate;
- physical properties (particle size, % H_2O, etc.) and chemical characteristics (composition, complexes, etc.);
- on-site sludge management method;
- disposal methods (transportation off the site, clay cells, containment ponds, tailings ponds, etc.);

e) a description of the various sedimentation ponds (area covered, capacity, average retention time, embankment types, etc.);

f) a description of the final effluent sampling station (instrumentation, continuous monitoring, etc.).

7.1.7 Ore, Waste Rock and Concentrate Piles

The following elements must be presented in detail:

a) a plan of the site's current topography showing the location of the various accumulation areas (including ore and concentrate piles, where applicable);

b) geology of the bedrock and surface deposits;

c) physical and chemical characteristics of the materials in the accumulation areas (particle size distribution, moisture content, mineralogy, acid mining drainage generation potential, etc.);

d) physical and chemical site characteristics (description of accumulation area subsoils);

e) geotechnical studies (physical stability of structures) in keeping with the standards contained in Appendix 1;

f) accumulation area selection study[6];

g) method used to dispose of materials on accumulation areas;

h) effluent monitoring methods, where applicable.

7.1.8 Tailings Pond

In addition to the information requested in Section 7.1.7, the proponent must provide the following:

a) design of the tailings pond (include sections and plans describing engineering structure geometry);

b) type of materials used to build the tailings pond and their physical and chemical characteristics;

c) physical and chemical characteristics of tailings (particle size distribution, moisture content, mineralogy, potential for generation of acid effluent, etc.);

7.1.9 Topsoil and Unconsolidated Deposit Dumps

The proponent must describe the storage facilities currently used or anticipated and the measures implemented to prevent water and wind erosion.

7.1.10 Other Areas Used

The proponent must indicate the location of other areas used on a map and briefly describe their contamination status, where applicable.

Once mining activities are permanently shut down, the proponent must assess the soil quality of the areas where ore or concentrate was transferred, where hoists, compressors, garages, and warehouses were located and scrap metal, sludge, etc. were stored, indicating any potential contaminants.

For *active* mining operations, the proponent should provide a preliminary assessment of contamination levels and, where applicable, the scope of work required. The soil quality assessment could be restricted to analysis of a few soil samples and an estimate of contamination levels.

7.1.11 Chemical Products

For all chemical products used during mining (explosives, oils, petroleum products, etc.), chemical reagents used in the ore and wastewater treatment plants and all other chemicals used on an industrial scale, the report must include:

a) list of chemical products;

b) location and description of storage sites;

c) assessment of the storage site subsoil type;

d) final inventory of stored materials;

e) storage methods;

f) disposal method(s), where applicable.

6. When applying for a tailings disposal site, the proponent already submitted a site selection study as per the *Regulation respecting mineral substances other than petroleum, natural gas and brine (M-13.1, r.1, s. 85, 86)*. If the proponent has not submitted such a study for an existing site, he need only provide section and surface plans.

7.1.12 Solid Waste

If wood scraps, scrap metal and domestic waste are disposed of on the mining site, the proponent must briefly describe the characteristics of the disposal area. Otherwise, he need simply indicate where this waste will be disposed of (coordinates of the disposal site(s) used) and the name of the firm mandated to perform the work, where applicable.

7.1.13 Hazardous Waste

The proponent must describe the hazardous waste (used oils, oils containing PCBs, etc.) management method, and indicate whether this waste will be stored on the mining site. If so, he must provide the information indicated in Section 7.1.11 a) to f).

7.2 Site Rehabilitation Program

The proponent must present the site rehabilitation option chosen. Where applicable, the study of the various mining site rehabilitation options considered for the accumulation areas, especially those involving tailings generating acid mining drainage must be described in an appendix and contain all the information indicated in Appendix 4.

7.2.1 Research and Development

Within the context of research and development related to site restoration and rehabilitation (revegetation, stability studies, encapsulation of waste generating acid mine effluent, etc.), the proponent must include an appendix describing R&D activities, anticipated or actual results, and a work schedule for past or current R&D. Where applicable, he must indicate plans for future R&D either related to study projects, master's or Ph.D thesis, publications in specialized journals, studies by consulting firms or joint projects with organizations such as the CRM, CANMET, MEND Program, etc.

7.2.2 Site Safety

The proponent must explain the safety measures implemented to prevent access to surface openings (shaft, open stopes, etc.) and excavations. He must also demonstrate the stability of surface structures (open pit wall; benches and berms) and underground structures (surface pillars), or present the methods to be used to sustain and consolidate them.

7.2.3 Buildings and Surface Infrastructures

The report must describe the methods used to dismantle and dispose of buildings (structures and foundations of the administrative, accommodation and service buildings, shafthouse, processing plant, etc.), support facilities and infrastructures (electrical transmission lines, water and gas pipes, waterwork and sewer systems, telephone cables, underground tanks, etc.), transportation infrastructures (roads, rails, bridges, culverts, ditches, etc.), electrical equipment and infrastructures (pylons, electrical cables, transformers, etc.), and methods used to restore the adjoining land.

It must also list of the main elements that will be removed from the site along with a plan showing the siting of all buildings, support systems, electrical equipment, and support, electrical and transportation infrastructures to be removed or kept on site.

7.2.4 Waste Rock Piles

The report must contain a complete, detailed description of the rehabilitation work to be done on the various waste rock piles (with or without accumulated materials at shutdown) and the associated infrastructures (water collection ditches, diversion systems, etc.).

The following elements involved in restoring accumulation areas must be addressed:

a) structural stability studies (Appendix 1);

b) topographic plans showing the location of water management structures (and their connection with the drainage system after site shutdown) and of sampling stations in order to monitor both physical and chemical stability (acid mining drainage, where applicable);

c) plan view and sectional view of final pile slopes after rehabilitation and, where applicable, zones of the various material types within the piles;

d) a description of the flood management system in and around the accumulation areas;

e) the estimated change in the water balance in waste rock pile groundwater. Where applicable,

the proponent must take into account constituent rock degradation over time;

f) for waste rock piles generating acid effluent, control methods (covers and waterproofness mechanisms), their components and thickness, physical and chemical characteristics (potential for acid mining drainage generation for tailings) of the materials used for rehabilitation (particle size distribution, mineralogy, water retention capacity, permeability, etc.);

g) estimated maintenance needs.

7.2.5 Tailings Pond

The report must contain a complete and detailed description of the rehabilitation work to be done on the tailings pond and associated infrastructures (ponds, water drainage and control system, decant towers, spillways, irrigation and retention diversion systems, etc.).

The following elements involved in restoring tailings ponds and related infrastructures must be addressed:

a) control methods (covers and waterproofness mechanisms), their components and thickness, physical and chemical characteristics (potential for acid mining drainage generation for tailings) of the materials used for rehabilitation (particle size distribution, mineralogy, water retention capacity, permeability, etc.);

b) structural stability studies (Appendix 1);

c) topographic plans showing the location of water management structures (and their connection with the drainage system after site shutdown), control equipment for particle sedimentation and sampling stations in order to monitor both physical and chemical stability (acid mining drainage, where applicable);

d) a description of the flood management system in and around the tailings pond;

e) the estimated change in the water balance in the tailing pond;

f) the estimated change in the water level in the tailing pond and in the adjoining groundwater;

g) estimated maintenance needs;

h) the volume of contaminants associated with embankment seepage loss into the receiving environment and the groundwater.

7.2.6 Wastewater Treatment Facilities

Should effluent treatment prove necessary after mining activities are permanently shut down, the proponent must refer to the information indicated in Section 8.2. of this document. Otherwise, he must describe the work involved in restoring treatment facilities and related infrastructures.

7.2.7 Other Water Management Infrastructures[7]

The other water management infrastructures are dams, spillways, collection and diversion ditches, bridges, culverts, pipes, pumphouses, etc.

The report must include:

a) a topographic plan showing the location of the various infrastructures once mining activities are permanently shut down;

b) a description of how the areas under structures no longer needed after the shutdown of mining operations will be restored;

c) a description of the infrastructures that will remain on the site after site shutdown (physical stability, maintenance, etc.).

7.2.8 Sanitary Facilities

The proponent must draw up a list of the facilities located on the site, and explain how he will dispose of them after mining activities are permanently shut down.

7. The installations and infrastructures not covered under sections 7.2.4, 7.2.5 and 7.2.6 should be described in this section.

7.2.9 Equipment and Heavy Machinery

The proponent must provide a list of equipment (mining and ore processing equipment) and heavy machinery located on the site, and explain how he will dispose of them, on the site or off the site, after mining activities are permanently shut down.

7.2.10 Petroleum Products, Chemical Products, Solid Waste, Hazardous Waste, Contaminated Soils and Contaminated Materials

For each of these elements, the report must describe the management methods envisaged. Justification must be provided for materials that are to remain on-site and storage conditions must be described in detail.

8. EMERGENCY PLAN

The report must contain an action plan for high-risk accidents (land and rock slides in unconsolidated deposits, major embankment bursting, collapse of underground worksites, etc.) that might occur on the mining site during rehabilitation and thereafter. This plan must include:

a) emergency measures to be implemented;

b) measures and methods to restrict the risk zone (evacuation, barriers, etc.);

c) coordinates of persons responsible for the mining site and the organizations to contact (municipality, environmental emergency service, police, etc.).

9. MONITORING PROGRAM

This chapter deals with monitoring of the shutdown of the underground exploration and mining activities once rehabilitation is terminated. A monitoring program must be implemented to ensure that rehabilitation and remedial measures after site shutdown are effective.

9.1 Physical Stability

Once the monitoring program (physical stability) is implemented, the proponent must detail the following:

a) its objective;

b) location of control stations;

c) work schedule (control period and inspection frequency);

d) type of monitoring (visual inspections, measures, parameters, etc.);

e) instrumentation used (piezometers, etc.);

f) inspection methods, data compilation and evaluation of information gathered;

g) coordinates of the persons responsible for monitoring.

9.2 Environmental Monitoring

Once environmental monitoring is implemented, the proponent must add an environmental monitoring program to the plan detailing the following:

a) its objective;

b) location of control stations (on-site, upstream and downstream of the receiving environment, groundwater, etc.);

c) parameters (physical, chemical and biological);

d) a description of the sampling tools and measurement systems used (pH, flows, etc.);

e) work schedule (monitoring period and sampling frequency);

f) a brief description of the physical, chemical and biological analysis techniques and their accuracy, the instruments used and detection limits[8];

g) method used to compile and assess data;

h) coordinates of the persons responsible for monitoring and the laboratory responsible for analysis.

8. The information related to this section may be presented in an appendix at the end of the report.

If effluent treatment facilities need to be maintained, the environmental monitoring program proposed must include:

a) a description of the facilities (including sedimentation ponds and control equipment) and treatment processes;

b) the estimated period of annual use and maintenance and operation requirements;

c) the estimated volume and characteristics of the effluent produced and the water to be treated;

d) for sludge:

- the estimated production rate and characteristics;
- a description of treatment, storage or elimination methods;
- a brief description of the disposal site's characteristics if sludge is stored or eliminated on-site;

e) coordinates of the person(s) responsible for water treatment facilities maintenance and operation.

9.3 Agronomical Monitoring

The agronomical monitoring program must include:

a) type of monitoring (visual inspections, measures, sampling, soil and plant tissue analyses, etc.);

b) fertilizer application data (type, frequency, surface area involved, etc.);

c) repeat fertilizers and shrubbery planting (species, surface, etc.), where applicable.

10. CONSIDERATIONS OF AN ECONOMIC AND TEMPORAL NATURE

10.1 Restoration Cost

The proponent must describe in detail the rehabilitation cost (in current dollars) by activity (detailed description of the fees related to each activity including administration and design fees) as if all work was carried out by a third party. The cost of progressive rehabilitation and the monitoring program (environmental, agronomical and the physical stability) must be included.

The cost of rehabilitation must be based on quantifiable information available when the plan is submitted. As the plan is reviewed, increasingly precise cost estimate details must be supplied.

10.2 Work Schedule

For each element in sections 6.2 and 7.2 (Site Rehabilitation Program), this report must contain a detailed rehabilitation work schedule (progressive and after shutdown of mining activities) including the human and material resources involved.

The proponent must also provide the rehabilitation work schedule for wastewater processing plants (Section 7.2.6) once they are no longer operational.

PART 3
ADMINISTRATIVE PROCESS

INTRODUCTION

Part 3 comprises five chapters. Chapters 11 and 12 explain how the rehabilitation plan is processed once it is received by the government. Chapter 13 indicates what information must be submitted to the MRN every year, and Chapter 14 describes the type of financial guarantee required and its payment. Chapter 15 constitutes the bibliography.

11. PLAN SUBMISSION AND CORRESPONDENCE

Five copies of the rehabilitation plan report or the revised plan where applicable (in french) and one copy of the document describing the financial guarantee must be submitted to the following addresses:

Ministère des Ressources naturelles
Services des titres d'exploitation
5700, 4e Avenue Ouest, local A 115
Charlesbourg (Québec) G1H 6R1
or
Ministère des Ressources naturelles
Services des titres d'exploitation
400, boul. Lamaque
Val-d'Or (Québec) J9P 3L4

The document describing the financial guarantee, along with the guarantee itself, must be sent in a separate envelope marked "**CONFIDENTIAL**".

Please note that all documents and information submitted to the MRN and other government departments for consultation are subject to the *Act respecting access to documents held by public bodies and the protection of personal information (R.S.Q., c. A-2.1)*. Work governed by section 8.1 of this Act is also subject to sections 215 and 228 of the *Mining Act*.

12. PLAN EVALUATION AND APPROVAL

12.1 Departments and Organizations Consulted

The rehabilitation plan report (excluding the description of the financial guarantee) will be forwarded to the MEF for consultation. One copy of the rehabilitation plan must be submitted to the Ministère des Ressources naturelles - Secteur des forêts and, where applicable, any other government department or organization concerned.

12.2 Rehabilitation Plan Approval Process

Table II shows the different steps in the rehabilitation plan approval process and the evaluation of the financial guarantee by the MRN. This procedure may apply to both exploration and mining activities, whether for approval of the initial rehabilitation plan or a revised version.

It takes approximately four months to study a rehabilitation plan for exploration activities and eight months to study a rehabilitation plan for mining activities. The time frame will depend on:

- the number of files to be studied and their complexity;
- whether all the necessary supporting documents (plans, studies, stability analysis, etc.) have been included in the rehabilitation plan;
- whether or not the technical information included in the rehabilitation plan is sufficient to make an enlightened decision.

13. ANNUAL FOLLOW-UP OF REHABILITATION WORK

The proponent must submit annual reports to the MRN briefly describing each of the following:

- rehabilitation work carried out;
- progress of rehabilitation work compared to the original work schedule submitted to the MRN;
- expenses incurred, particularly for rehabilitation of accumulation areas;

- where applicable, the results of:
- research and development activities;
- revegetation tests;
- progressive monitoring of rehabilitation work (in terms of quality).

The purpose of the annual report is to inform the MRN and the MEF of the progress of rehabilitation work. It is not to be used to review the content of the rehabilitation plan. The annual report must be submitted to the MRN no later than 60 days after the anniversary date (the date the rehabilitation plan was approved).

The proponent need not submit an annual report if the date of its submission falls on the plan review date.

TABLE II

Rehabilitation Plan Approval Process

	STEPS	*DESCRIPTION*
I	The MRN verifies the plan's content.[a]	It does so to ensure that the report is complete (all supporting documents are included).
II	The MRN examines the plan and forwards it to the MEF and any other government department concerned.[a]	The plan is examined to make sure it meets the approval criteria and to verify the scope of the work involved. After this, consultation begins.
III	The plan is evaluated by the MRN, the MEF and any other government department concerned.[a]	Each department examines the part of the plan which concerns it. Meetings are scheduled to analyze the report.
IV	The MRN analyzes the financial guarantee.	The aim is to verify the description of the guarantee, the cost of the project, etc.
V	The MRN approves the plan; the terms of the letter of authorization are drafted.[a]	The opinions issued by the MEF and the other departments concerned are studied and used to draft the terms of the letter of authorization.
VI	The MRN transmits the letter of authorization to the proponent.	The written authorization stipulates the terms of payment of the guarantee, MRN requirements and the requirements of the other departments concerned.
VII	The financial guarantee is deposited.	Once the plan is approved, the proponent must deposit all or part of the financial guarantee.
VIII	Mining operations begin or continue.	Operations are monitored by the authorities concerned.

[a] The proponent will be advised if the report is being studied or if additional information is required.

14. FINANCIAL GUARANTEE

A certified true copy of all contracts and agreements between companies and guarantors must be submitted to the MRN.

The financial guarantee is a key component of the rehabilitation plan and the essence of the amendments to the *Mining Act (M-13.1, r.1, s. 96.5 to 96.16)*. The purpose of the guarantee is to ensure that funds will be available for the eventual rehabilitation of accumulation areas.

14.1 Accepted Guarantees

The financial guarantee must be submitted in one of the following forms or a combination thereof:

1° a cheque made out to "the Minister of Finance of Québec";

2° bonds issued or guaranteed by Québec or another Canadian province, by Canada or by a Canadian municipality with a minimum market value equal to the amount of the guarantee required;

3° a guaranteed investment certificate or term deposit certificate, in Canadian dollars, issued to the Minister of Finance by a bank, savings and credit union or trust company. The certificate must have a 12-month minimum term, be automatically renewable until the issue of a certificate of release provided for in section 231.10 of the *Mining Act*, and not include any restriction as to its redemption during term;

4° an irrevocable, unconditional letter of credit issued to the Québec government by a bank, savings and credit union or trust company;

5° a security or guarantee policy issued to the Québec government by a company legally authorized to do so;

6° a security provided by a third party to the Québec government. The person providing the security must also provide an immovable hypothec of the 1st rank whose net liquidation value is at least equal to the amount of the guarantee required;

7° a trust constituted as per the Civil Code of Québec and meeting the following requirements:

- the purpose of the trust is to ensure completion of the work provided for in the rehabilitation and restoration plan under sections 232.1 to 232.10 of the *Mining Act*;
- the Minister of Finance and the person referred to in section 232.1 of the *Mining Act* are joint beneficiaries of the trust;
- the trustee is a bank, savings and credit union or trust company;
- the trust patrimony is comprised only of sums in cash, or bonds or certificates of the same type as those referred to in subparagraphs 2 and 3.

The person referred to in section 232.1 of the *Mining Act* may choose to submit the guarantee in any of the above forms, depending on the rehabilitation objectives (progressive, short-term or long-term rehabilitation) and his financial capacity. The lending institutions are responsible for evaluating a company's capacity to pay the guarantee and the financial risk involved.

14.1.1 Cash Deposit, Bonds and Investment Certificates

Where the guarantee is submitted in the form of cash, a certified cheque, bonds or a guaranteed investment certificate, the money or securities are deposited with the Ministère des Finances in accordance with the *Deposit Act* until the certificate of release is obtained. However, the financial guarantee may be reduced when the plan is reviewed if the rehabilitation work has been completed, or increased if warranted by changes to mining activities.

The contract between the bank, savings and credit union or trust company must provide for the following:

a) that no person may make withdrawals or be reimbursed without prior authorization from the Minister. The purpose of the guarantee is to ensure completion of the work provided for in the rehabilitation plan;

b) that, should the Minister need to use some of the money to have rehabilitation work carried out, the guarantee becomes payable on request.

14.1.2 Letter of Credit

An irrevocable letter of credit is an agreement between a financial institution (bank, savings and credit union, trust company) and a company authorizing the bank to pay funds to a third party. The beneficiary of the financial guarantee for rehabilitation work is the Ministère des Ressources naturelles, subject to certain conditions stipulated in the letter of credit.

For as long as the letter of credit remains irrevocable, the financial institution must honour any legitimate requests made by the beneficiary in keeping with the terms of the letter of credit. Any change in these terms must be approved by all parties involved. The letter of credit is normally valid for one year, although this period may be longer under certain conditions. The agreement must provide for the automatic renewal of the letter of credit until the certificate of release is issued.

14.1.3 Security

A security is a commitment made by a third party to the MRN. The person submitting the rehabilitation plan commits himself, to the Ministère des Ressources naturelles, to complete the rehabilitation work provided for in the plan. The security guarantees payment for this work should the person fail to honour his commitments under the plan.

The security may be issued by certain insurance companies through a security broker. The broker's role is to find an insurance company and draft a security agreement. The security may also be issued by a financial institution such as a bank, savings and credit union or trust company.

14.1.4 Trust

The trust must be constituted in accordance with the provisions of the Civil Code of Québec and indicate that:

- the sums accumulated are to pay for the rehabilitation work;
- the Minister of Finance and the person submitting the rehabilitation plan are joint beneficiaries of the trust;
- the trust patrimony is comprised only of sums in cash, bonds or a guaranteed investment certificate.

Interest generated by the trust patrimony belongs to the trust. Interest kept as part of the trust patrimony may not be used to pay the guarantee. This form of guarantee is recognized for taxation purposes by the federal and provincial governments.

14.1.5 Security Provided by a Third Party

Under the *Mining Act*, a third party may provide the security required as long as it also provides an immovable hypothec of the 1st first rank whose net liquidation value is at least equal to the amount of the guarantee required. This allows a parent company to assume the site rehabilitation obligations of the person referred to in Section 232.1 of the *Mining Act*.

14.2 Amount and Payment of the Guarantee

The amount of the guarantee depends on the rehabilitation plan and corresponds to 70% of the estimated cost of restoring accumulation areas as defined in Section 9.1. The accumulation areas targeted by the financial guarantee are: the tailings pond, including sedimentation and polishing ponds, waste rock piles, mining waste piles, concentrate/ore stockpiles, and mine water ponds.

14.2.1 Exploration

Where exploration is expected to last one year or less, the total guarantee must be submitted within 15 days of the rehabilitation plan's approval if accumulation areas are to be built specifically for this activity. Where exploration is expected to last more than one year, and where the rehabilitation plan has been approved, the guarantee must be submitted in annual payments, with the first payment corresponding to the estimated cost of the rehabilitation work for activities already being carried out or to be carried out during the year. Each subsequent annual payment must correspond to the estimated cost of rehabilitation work to be carried out that year.

14.2.2 Mining

For mining activities, the number of annual payments of the guarantee is established based on their expected duration (Table III). Operators will be informed of the payment schedule (maximum of 15 years) once the

rehabilitation plan has been approved. The expected duration of mining activities is determined when the plan is approved or revised.

Where applicable, the first payment of the guarantee is payable within 15 days of the rehabilitation plan's approval. Where mining activities are expected to last less than 10 years, a payment may be postponed and added to the next annual payment. No postponement is possible in the last two years of payment.

Where mining activities are expected to last 10 years or more, two consecutive payments may be postponed. No further postponement is possible until the postponed payments have been made, and no postponement is possible in the last three years of payment.

14.2.3 Special Provision

Under Section 232.5 of the *Mining Act*, the Minister may, under certain conditions, require advance payment of all or part of the financial guarantee.

14.2.4 Co-ownership

Since some mining sites are co-owned, partners may underwrite the guarantee according to the percentage of their holdings in the mine. The partners may also choose to appoint an operator to be responsible for submitting the financial guarantee.

14.3 Review of Plan and Guarantee

The rehabilitation plan is to be revised every five years unless a shorter time frame is set by the MRN on approval of the plan or revised plan. It may also be reviewed wherever amendments are justified by changes in mining activities; these amendments may be made on the operator's initiative or at the request of the MRN *(M-13.1, s. 232.6)*.

The amount of the financial guarantee may be increased or reduced *(M-13.1, s. 232.7)* based on:

a) the progress of the rehabilitation work compared to the schedule;

b) the amount of rehabilitation work completed when the mine is shut down;

c) whether or not the proponent intends to use more economical rehabilitation methods.

If the person governed by Section 232.1 of the *Mining Act* fails to carry out the rehabilitation work and the MRN must have it carried out in his place, the MRN may recover the cost of the work from the guarantee.

14.4 Duration of the Guarantee

The guarantee must remain in effect until the certificate of release provided for in Section 232.10 of the *Mining Act* has been issued. It may be issued if:

a) the person has carried out the rehabilitation work in keeping with the rehabilitation plan and to the MRN's satisfaction;

b) a third person assumes the obligations.

TABLE III

Schedule of Annual Payments
per $1 of the Guarantee
(Established under Section 96.5 of the *Mining Act*)

Payment →	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Expected duration of activities ↓															
1	1.0														
2	1.0	-													
3	.250	.750	-												
4	.111	.333	.556	-											
5	.063	.187	.313	.437	-										
6	-	.063	.187	.313	.437	-									
7	-	.040	.120	.200	.280	.360	-								
8	-	.028	.083	.139	.194	.250	.306	-							
9	-	.020	.061	.102	.143	.184	.225	.265	-						
10	-	-	.020	.061	.102	.143	.184	.225	.265	-					
11	-	-	.016	.047	.078	.109	.141	.172	.203	.234	-				
12	-	-	.012	.037	.062	.086	.111	.136	.161	.185	.210	-			
13	-	-	.010	.030	.050	.070	.090	.110	.130	.150	.170	.190	-		
14	-	-	-	.010	.030	.050	.070	.090	.110	.130	.150	.170	.190	-	
15	-	-	-	.008	.025	.041	.058	.074	.091	.107	.124	.141	.157	.174	-

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APPENDIX 1

STABILITY CRITERIA

This appendix presents the main structural stability criteria applying to mining waste accumulation areas, including waste rock piles and tailings ponds, and provides guidelines for rehabilitation work following the shutdown of mining operations. The criteria presented here concern rehabilitation work alone and in no way limit the guidelines given elsewhere in this working document. Other or more restrictive criteria may thus apply in certain cases. Proponents may use analytical methods and approaches other than those suggested here as long as they show that these procedures are recognized and appropriate.

GUIDELINES

The structural stability of accumulation areas is defined as their capacity for fulfilling the functions for which they were designed. Usually, this implies that infrastructures must be able to maintain their geotechnical integrity without rupturing or undergoing excessive deformation. This principle applies to retention and containment structures (e.g. embankments), control structures (e.g. spillways), impervious capping materials (e.g. wet or dry cover) and mining waste itself (e.g. waste rock piles).

a) Site investigation techniques, methods for determining the properties of materials (fill, foundations and other infrastructures) and procedures for setting up tailings ponds and compacting tailings must be properly applied. Where applicable, Bureau de normalisation du Québec (BNQ), Canadian Standards Association (CSA) and American Society for Testing and Materials (ASTM) standards must be met.

b) Infrastructure inspection programs must adhere to the guidelines presented in Chapter 8 of this document. In addition, they must be implemented for at least two years after rehabilitation work has been completed.

c) Preferably, surface erosion problems should be controlled through vegetative cover. However, other forms of control may also be considered.

d) Erosion problems in unconsolidated deposits may be eliminated by reducing hydraulic gradients. When materials of different particle size are placed in contact with one another, appropriate filter criteria must be met.

e) Stability calculations must be based on long-term conditions that may affect structures. In addition, they must take anticipated static and dynamic loads into account.

   In evaluating structural stability, the minimum operational life of all sites with acid-generating potential is 100 years. The operational life of all other sites must be determined according to the particular characteristics of each site (50 years or less). In all cases, gradual alterations in the properties of materials as well as ensuing changes must be taken into consideration.

f) Where applicable, static stability must be calculated for all Québec regions. When the value of the seismic coefficient (K) is other than zero, static stability must be recalculated using the appropriate coefficient. This may be determined using Figure 1 and Table I or by contacting the Geological Survey of Canada:

CANMET: Geological Survey of Canada
Geophysics Division, Seismology Section
1 Observatory Crescent
Ottawa (Ontario), K1A 0Y3
Tel. (613) 995-5548
(Service available in English)
(613) 995-0600
(Service disponible en français)
FAX (613) 992-8836

Seismic coefficients are based on an annual exceedence probability of 1/476 (10% over 50 years). For all sites with acid-generating potential, the values given in Table I should be adjusted for an annual exceedence probability of 1/1000 (around 10% over 100 years).

TABLE I
Seismic Coefficients

Zone 0	Zone I	Zone II	Zone III	Zone IV
K = 0	K = 0.05	K = 0.10	K = 0.15	K = 0.20

WASTE ROCK PILES

g) The risk associated waste rock pile instability must first be determined. The nature and extent of anticipated damage, exposure time and impact on the population, infrastructures and main watercourses must then be established.

In zones where a potential risk has been identified, waste rock pile instability may be assessed using the Dump Stability Rating (DSR; Ref. No. 8) classification scheme. Other methods may also be used as long as they have proven reliable.

For waste rock piles whose probability of failure is classified as medium or high, stability analyses should be carried out using effective stress if pore water pressure and water table position are known.

h) The analytical methods applied must be compatible with the various base failure diagrams for waste rock piles or foundations. The prescribed factor of safety (FS) values are shown on Table II. Where the values obtained are less than those in the table, more in-depth stability analyses may be considered satisfactory. If not, appropriate remedial measures will have to be taken.

TAILINGS PONDS

i) Tailings embankments must be designed to resist dynamic and static stress. The potential threat to the population and infrastructures must be taken into consideration in determining the factor of safety. The prescribed factor of safety values are shown in Table III. Where the values obtained are less than those in Table III, more in-depth stability analyses may be considered satisfactory. Remedial measures may also be taken to enhance stability.

j) Proponents must evaluate the liquefaction potential of processing waste or demonstrate that the confining pressure will always be higher than pore water pressure (non-liquefiable waste).

The liquefaction potential may be estimated using methods based on the standard penetration test (SPT) and employing corrected, adjusted and normalized N values. In cases with confirmed liquefaction potential, proponents must conduct appropriate analyses or take the necessary remedial measures to prevent the waste from liquefying.

k) For sites using water cover as a protection against acid mine drainage, a 1000-year return period should be used to calculate the probable maximum flood. This calculation must be based on probable maximum precipitation, established using one of the following rainfalls:

- 6-hour rainfall
- 24-hour rainfall

The volume of water considered in the probable maximum flood is estimated using the sum of probable maximum precipitation and average snowmelt over a 30-day period (the amount of snow corresponds to the foreseeable maximum amount with a recurrence interval of 100 years). Each tailings pond must be able to contain at least 50% of the probable maximum flood, provided the rest can be managed by appropriate, properly maintained spillways (with a peak flow corresponding to 90% of the remaining water evacuated in 10 days).

The minimum freeboard should be 1 m when the pond is full, while the crest width (W) should be calculated using the following equation:

$W \geq h/5 + 3$,

where h is the height of the embankment (in metres) and W is always greater than 3.65 m.

FIGURE 1

Seismic zoning map

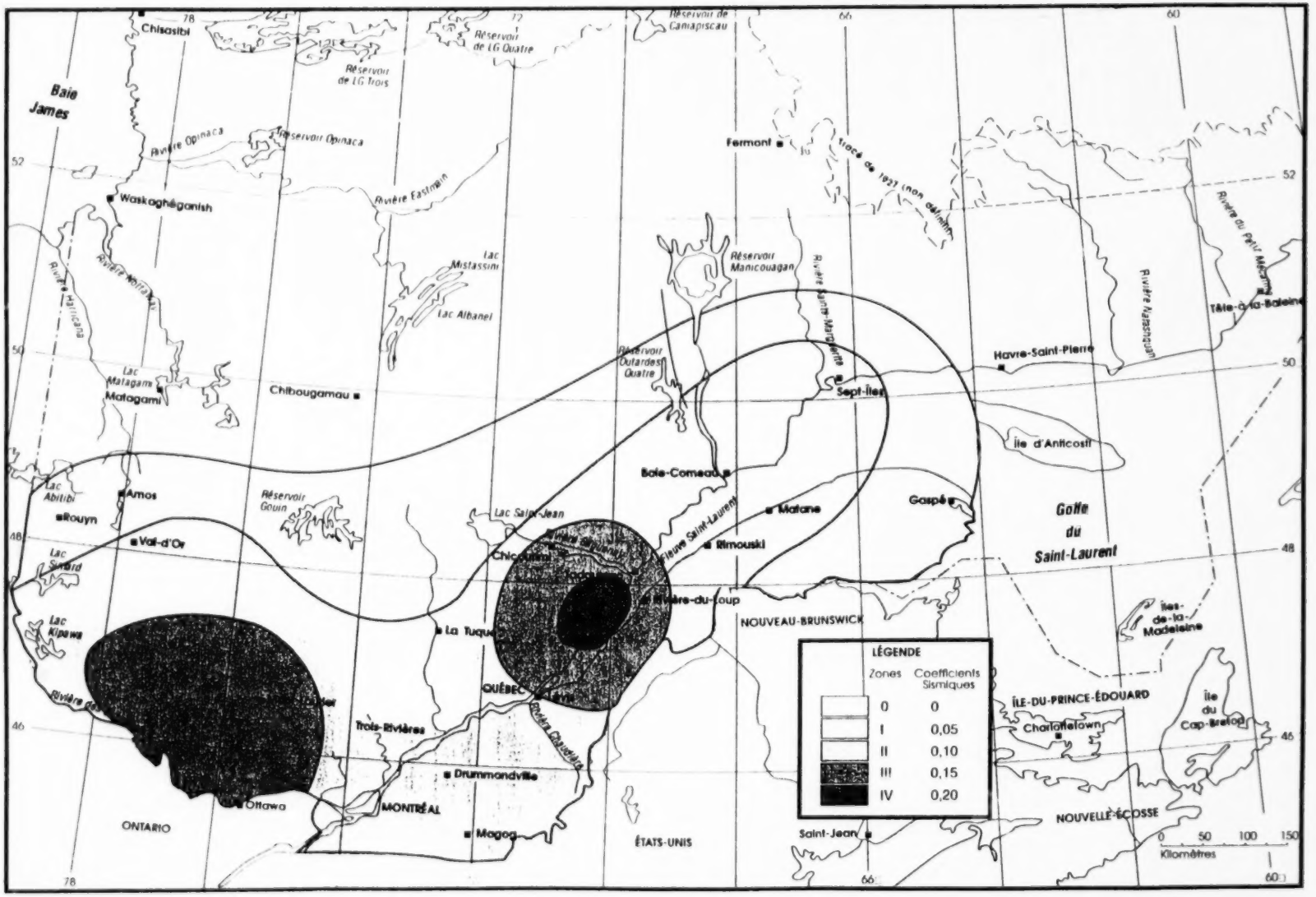

TABLE II

Minimum Factors of Safety
For Long-Term
Waste Rock Pile Stability

Zone	Factor of safety
Seismic zone 0	Static stability analysis, FS ≥ 1.5
Seismic zones I, II, III and IV	Pseudo-static stability analysis, FS* ≥ 1.1.-1.3
Bearing capacity of soil beneath fill	FS ≥ 1.5

* The range of FS values is based on anticipated damage

TABLE III

Minimum Factors of Safety for Stability Analyses

Zone	Condition	FS
Downstream	Static loading and steady flow* (peak shear strength)	1.3 - 1.5
Downstream	Dynamic loading and steady flow* (peak shear strength)	1.1 - 1.3
Upstream/Downstream	Rapid drainage** (static analysis)	1.3
Upstream/Downstream	Rapid drainage** (pseudo-static analysis)	1.1
Centreline	Horizontal sliding of embankment as a result of static loading (lateral pressure)	1.5
Centreline	Horizontal sliding of embankment as a result of pressure exerted by tailings during liquefaction (positive liquefaction potential)	1.3
Centreline	Bearing capacity of soil beneath fill	1.5

* The range of FS values is based on anticipated damage.
** Applicable only to sites using water as capping material.

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8- PITEAU ASSOCIATES ENGINEERING LTD. *Investigation and Design of Mine Dumps - Interim Guidelines.* Prepared for the B.C. Mine Dump Committee, May 1991, 165 p.

9- SEED, H.B., IDRISS, I.M. and ARANGO, I. *Evaluation of Liquefaction Potential Using Field Performance Data.* J. Geotech. Eng., ASCE, 109(3), 1983, p. 458-482.

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11- VICK, S.G. *Planning, Design, and Analysis of Tailings Dams,* BiTech Publishers Ltd., 1990, 369 p.

APPENDIX 2
SPECIFICATIONS FOR REPORT FORMAT

1. Sizes and Scales

The rehabilitation plan should be presented on standard size paper, i.e. 215 mm x 297 mm (8 " x 11"). Paper 215 mm x 356 mm (8 " x 14") or 297 mm x 432 mm (11" x 17") should be used only for graphics.

The report should be bound (spiral or ring binder) and protected with a hard or semi-hard cover.

The proponent should use the International System of Units (SI) for plan measurement units. However, both metric and Imperial units will be accepted. *The plans must be certified, dated and signed by an engineer.* Graphics and visual documents should comply with Table I.

2. Content

The title page must contain the name of the project and the proponent, and the date of the report.

The report must include the name and address of the company, and the name, profession and duties of the authors. The rehabilitation plan and cost estimates must be approved by the proponent or the person authorized to act on his behalf (See Section 5.2).

The document must include a clear, concise summary in accessible language. It must be informative, outline the scope of the project, detail the basic hypotheses, and indicate new elements, especially anticipated results. It must contain all relevant information. Tables may be used to present results.

Information which is essential to a proper understanding of the document must be included in the body of the text. Any additional information which may be cumbersome or unessential to the text must be presented in the appendices.

All documents used to prepare and produce the report must be available to the various government departments for consultation. If reference documents are not extensive, they should be included in the appendices to accelerate the review process.

Calculation details must be included in the appendices. Only results and statistics are to be presented in the body of the text. Degree of accuracy must be indicated.

References must be presented in the report. Information cited or referred to must have accompanying footnotes or, where applicable, endnotes.

TABLE I

Sizes and Scales for Support Documents

Types of visual documents	Scale
Plans for mining property location.	1: 10 000, 1: 20 000 or 1: 50 000 (M-13.1, r.1, s.77).
Plans for underground infrastructures.	≥ 1: 2 500 (M-13.1, r.1, s.81).
Plans for buildings and surface infrastructures (overview plans of the accumulation areas) or plans for surface exploration activities.	≥ 1: 5 000 (M-13.1, r.1, s.81).
Plans for building components (concentrator, garage, warehouse, etc.) and location map.	Preferably on a scale not less than 1: 500.
Plans for sections and components of accumulation areas, dams, etc.	Preferably on a scale not less than 1: 500.
Aerial photographs[1]	Regular scale of 1: 15 000.
Topographic maps[1]	≤ 1: 50 000.
Photographs of the site(s)[1]	Size of 3 " x 5" with scale marks and cartographical location.
Cartographical data for impact studies[1]	On an easily readable scale with clear details.
Videos	VHS with scale marks.

[1] The five copies must be true to the originals.

APPENDIX 3
MEASUREMENT METHODS AND ANALYSIS TECHNIQUES

To enable the government to verify the quality of the information contained in the rehabilitation plan, the measurement methods used to acquire on-site data and the techniques used to analyze them must be presented and explained at the end of the report. The measurement methods selected must be consistent with generally recognized standards. The process used must be described in order to allow the observations, tests or calculations to be reproduced.

1. Measurement Methods

The proponent must include enough information to enable government authorities to determine whether the method is sufficiently accurate. The following must be included in the description:

a) sampling methods and location of sampling stations;

b) sample representativeness;

c) laboratory tests and semi-industrial tests;

d) compilation method and evaluation of the information gathered (statistical tests, calculations, compilation software, source of statistical data, etc.).

2. Analysis Techniques

Information on analysis methods (chemical, physical and biological), methodology and instruments used, detection limit and analysis precision, bibliography and governing standards must be included in the appendices.

For further information on analysis procedures, see the following two Ministère de l'Environnement et de la Faune documents: *Guide des méthodes de conservation et d'analyses d'eau et de sol* (Ref. No. 10) and *Guide de procédure et de contrôle de la qualité pour les travaux analytiques contractuels en chimie* (Ref. No. 15). The proponent may also consult *Méthodes d'analyse de diverses substances minérales* (Ref. No. 21), published by the Centre de recherche minérale of the Ministère des Ressources naturelles.

The recognized methods for forecasting and evaluating acid mine drainage are indicated below.

2.1 Static Predictive Tests

The aim of static predictive tests is to identify geological units or mining tailings with net acid-generating potential. To carry out these tests, we recommend the method developed by the B.C. Research Center and used by the Environmental Protection Service of Environment Canada (Ref. No. 6).

The test is divided into two parts:

a) determination of acid-generating potential (AGP). This value is obtained by analyzing the total sulphur content in the sample, expressed in kg of H_2SO_4/t. The AGP value may be high, since all the sulphur in the sample is considered to be acid-producing;

b) determination of neutralization potential (NP). This is determined by measuring the acid consumption required to maintain a pH factor of 3.5 (for a minimum of 4 hours) a sample of a solid mixed with water and shaken. This value corresponds to the upper limit of biological/organic oxidation. The level of acid consumption is expressed in kg of H_2SO_4/t.

Net acid-generating potential is obtained by subtracting AGP from NP. If the difference between the acid production potential and the neutralization potential is between 20 and -20 kg H_2SO_4/mt, a kinetic predictive test is required. This range takes into account the analytical margin of error, the conversion of sulphur content into H_2SO_4, the short time frame for carrying out the test, and the sample's true acidity and neutralization capacity.

2.2 Kinetic Predictive Tests

Kinetic predictive tests are aimed at verifying static test results. They enable acid-generating potential and speed, sulphur oxidation, neutralisation, and metal leaching to be determined. There are several such tests, the most common being:

1. B.C. Confirmatory Test, developed by the task force on acid mine drainage (B.C. AMD Task Force)(Ref. No. 5).

2. Shake flasks (Ref. No. 5).

3. Humidity cells (Ref. No. 5).

4. Soxhlet reactors (Ref. No. 5).

5. Columns and lysimeter (Ref. No. 5).

6. Tests plots and test piles (Ref. No. 5).

We recommend these tests for use in determining acid-generating potential. However, we would be willing to consider any other test fine-tuned and endorsed by more than one of the following organizations:

- Ministère de l'Environnement et de la Faune (MEF);
- Centre de recherche minérale (CRM);
- Environment Canada;
- B.C. Task Force on Acid Mine Drainage (B.C. AMD Task Force);
- MEND Committee (Mine Environment Neutral Drainage);
- Canadian Center for Mineral and Energy Technology (CANMET).

APPENDIX 4

EVALUATION METHOD FOR THE VARIOUS REHABILITATION OPTIONS FOR ACCUMULATION AREAS

1. Working Hypothesis

In the appendices, the proponent must provide all working hypotheses used to compare and select mining site rehabilitation methods.

2. Selection and Weighting Criteria

In this section, the proponent must present the evaluation criteria for the proposed rehabilitation methods. The method chosen (checking systems, interrelations grids, etc.) and the elements used to support the proposal must be explained. The following elements must be included:

a) feasibility (technically and economically proven methods);

b) efficiency and reliability of the methods used;

c) durability (mid-term and long-term given environmental restrictions);

d) inspection and maintenance needs;

e) site safety;

f) cost (short-term and long-term);

g) risks with environmental impact.

In evaluating risks with environmental impact, the proponent should consider events that might occur after rehabilitation work (short-, medium- and long-term). He must also consider structural reliability (deficiency risks, risks associated with recurrence periods) and proposed methods, the extent of potential impacts and control capacity in the event of reduced performance or breakage. The analysis must take potential impacts on the human and natural environments into account.

3. Comparative Analysis of the Proposed Rehabilitation Methods

The proponent should first select potential methods using the available documentation (bibliography).

Using selection and weighting criteria, the proponent must analyze the various rehabilitation scenarios based on information from the relevant documentation. His comments must show:

- that the rehabilitation method is appropriate for the site;
- the main advantages and disadvantages of each method;
- the cost/benefit ratio of the solution selected. The proponent must describe the cost for each proposed rehabilitation scenario, comparing the costs related to the different possibilities studied for each activity.

Information sources and bibliographical references must be included for easy data access.

APPENDIX 5
BULK SAMPLING AUTHORIZATION
(under Section 69 of the *Mining Act*)

1. Underground and Surface Activities

1) Identity of property owner (for all properties):

- name of company;
- name of company representative;
- address;
- telephone and fax numbers.

2) Where applicable, identity of person mandated by the company:

- copy of letter of authorization;
- name of mandated company or agent;
- address;
- telephone and fax numbers.

3) Sampling site location:

- claim number;
- township where claim is located;
- common property name;
- precise plan preferably to a scale of at least 1:50 000 showing the exact location of the work;
- UTM coordinates sampling site location;
- specific environmental characteristics (proximity to spawning grounds, bird migration sanctuaries, ecological reserve projects, recreational areas, etc.).

4) Information on ore samples:

- maximum weight (metric tons);
- reasons for ore sampling;
- anticipated ore sampling period (beginning and end).

Where applicable:

- ore processing period (beginning, end, and treatment frequency);
- sampling period (beginning and end) in order to extract a smaller portion of ore from the initial sample for metal content analysis.

5) Photographs or any other recent visual document (i.e. video) clearly showing site condition prior to preparatory work.

6) A report describing the site preparation process, including the following:

- 1:5000-minimum site map;
- anticipated extent of ore sampling work;
- access roads (materials and construction);
- deforestation area (m^2);
- volume of loose soil and/or unconsolidated deposits to be moved (m^3);
- volume of rock to be excavated in order to access sampling material (m^3 and mt);
- location, size and characteristics of accumulation areas;
- environmental impact (description) of work to be carried out.

7) If sampling work does not include any of the work stipulated in Section 96.2 of the *Regulation on mineral substances other than petroleum, natural gas and brine (M-13.1, r.1)*, the application should include a summary of the proposed rehabilitation measures, and the intended means for carrying out rehabilitation work. Otherwise, the proponent must submit a rehabilitation plan as indicated herein (Section 4.1).

8) If the proponent applied to the MEF for a certificate of authorization, he must submit:

- a copy of the documents sent to the MEF (environmental impact report, description of the work, etc.);
- a copy of the certificate of authorization if issued by the MEF.

2. Underground Activities

The following information must be provided for underground activities:

1) Sampling site location:

- plan of underground activities showing exact site to a scale not less than 1:2 500 *(M-13.1, r.2, s.82, p.5)*;

- plan showing longitudinal sections of deposit (indicating sampling area) if tonnage is high.

NOTE: The document submitted may be used for work under sections 72 and 94 of the *Mining Act*. Reports should be drafted in keeping with the *Regulation on mineral substances other than petroleum, natural gas, and brine*. The report submitted becomes public property once approved by the Minister.

APPENDIX 6
STATUTES AND REGULATIONS

GOVERNMENT OF CANADA

Fisheries and Oceans Canada

- **The Fisheries Act** **(F-14)**
- Metal Mining Liquid Effluent Regulations (Chap. 819)

QUÉBEC GOVERNMENT

Québec National Assembly

- **Interpretation Act** **(I-16)**

Ministère des Affaires municipales

- **An act respecting land use planning and development** **(c. A-19.1)**

Ministère de l'Agriculture, des Pêcheries et de l'Alimentation

- **Act to Preserve Agricultural Land** **(P-41.1)**

Ministère des Ressources naturelles

Energy Sector

- **Act respecting the use of petroleum products** **(U-1.1)**
- Petroleum Products Regulation (U-1.1, r.1)

Forests Sector

- **Forest Act** *(c. F-4.1)*
- Regulation respecting standards of forest management for forests in the public domain

Mines Sector

- **Mining Act** **(M-13.1)**
- Regulation respecting mineral substances other than petroleum, natural gas, and brine (M-13.1, r.1)

Lands Sector

- **Act respecting the lands in the public domain** **(c. 23, T-8.1)**

Ministère de l'Environnement et de la Faune

- **Environment Quality Act** **(Q-2)**
- Regulation respecting the administration of the Environment Quality Act (Q-2, r.1.001)
- Regulation respecting pits and quarries (Q-2, r.2)
- Regulation respecting sanitary conditions in industrial or other camps (Q-2, r.3)
- Hazardous Waste Regulation (Q-2, r.3.01)
- Regulation respecting solid waste (Q-2, r.3.2)
- Regulation respecting drinking water (Q-2, r.4.1)
- Regulation respecting underground waters (Q-2, r.5.1)
- Regulation respecting waste water systems for isolated dwellings (Q-2, r.8)
- Regulation respecting environmental impact assessment and review (Q-2, r.9)
- Regulation respecting environmental impact assessment and review applicable to a part of the Northeastern Québec region (Q-2, r.10)
- Regulation respecting the environmental and social impact assessment and review procedure applicable to the Territory of James Bay and Northern Québec (Q-2, r.11)
- Regulation respecting air quality (Q-2, r.20)
- Directive sur les industries

minières (Directive No. 019)*

- Politique de réhabilitation des terrains contaminés, February 1988

Copies of these statutes and regulations are available from:

Les Publications du Québec
Case Postale 1005
Québec (Québec) G1K 7B5

Tel.: (418) 643-5150
Toll-free 1 800 463-2100

Fax: (418) 643-6177
Toll-free 1 800 561-3479

Web site: http://doc.gouv.qc.ca

* Available at Ministère de l'Environnement et de la Faune offices only.

APPENDIX 7
GLOSSARY

A

Accumulation area: Land on which mineral substances, overburden, concentrates or tailings have been, are or will be piled or accumulated. Mining water, sedimentation and polishing ponds are also considered accumulation areas.

Acid mining drainage: Drainage of acid water containing dissolved metals as a result of natural oxidization of sulphides found in waste rock, ore and tailings exposed to air and water.

Active mining site: Mining site currently in operation.

B

Backfilling: Burying tailings to ensure stope and underground opening stability.

Bench: In an open pit, the vertical distance between two berms (horizontal floors).

Berm: In an open pit, the horizontal distance between two benches (vertical floors) measured perpendicular to the pit's perimeter.

Bulk sampling: Sampling of more than 50 metric tons of mineral substances.

C

Characterization: Identifying contamination and the attendant risks and impacts. The purpose of characterization is to define site-specific contamination.

Work required is determined by the extent of contamination and may range from sampling to repeated drilling to building observation shafts.

Characterization study: See "Characterization".

Chemical characterization: Chemical features that define material: pH, alkalinity, acidity, adsorption, nutrients, exchangeable cation, chemical composition, acid mining drainage, metal, mineral and chemical compound content, etc.

Clay cell: Cell made using clayey material in order to limit the spread of contamination outside the cell.

Collection ditch: Ditch for collecting and channelling contaminated water away to a treatment area.

Concentrate: Valuable substance produced by physical and/or chemical treatment of the ore enabling the separation of marketable minerals from gangue.

Conceptual plan: Plan chosen from among various possible options, outlining the main points without including details (specifications).

Containment pond: Structure for accumulating solid or semi-liquid substances in prevent them from spreading into the environment, or to reduce spreading.

Contaminant: Any chemical substance whose concentration is higher than the basic concentration, or which does not occur naturally.

Contaminated soil: Soil whose chemical content is significantly higher than the basic concentration due to mining operations, or which contains substances that do not occur naturally.

Contamination: Undesirable presence of one or many substances likely to disturb the environment and impact on environment quality in any way.

Cover: Soil cover comprising a multi-layer system with or without vegetation, a damp barrier or any other contaminant containment process.

Culvert: A small bridge allowing traffic to travel over streams and brooks.

D

Decant tower: Structure for evacuating flood waters and maintaining tailings pond water levels.

Diversion ditch: Ditch for channelling water to prevent it from becoming contaminated.

E

Effluent: All mining wastewater discharged into the receiving environment.

Electrical infrastructures: Electrical systems and equipment, i.e. transmission lines, electrical cables, pylons, transformers, etc.

Embankment: Structure for containing tailings and mining effluent.

Equipment: Any device or fixed tool used in mining operations, including hoists, crane, cranes, underground rails, underground water and air pipes, various tanks, fans, pumps, crushers, flotation cells, cyanidation tanks, thickeners, etc.

Evaluation: Any survey, monitoring, inspection, test or data collection activity designed to determine:

1) the existence, source, nature and extent of contamination resulting from the discharge of hazardous material or chemical substances into the environment;

2) the extent of the hazard to human health, public safety and welfare and to the environment.

Evaluation includes studies, services and surveys designed to organize, manage and direct assessment, industrial site decommissioning, and clean-up operations.

Excavation: Any man-made surface opening or depression, i.e. trench, open pit, opening, etc.

Exploration: Mining activity aimed at discovering deposits or evaluating them (feasibility study); includes development work on the mineral deposits.

Extraction: The act of extracting ore, waste rock or tailings from an underground or open-pit mine. In this document, extraction also refers to the treatment process by which a substance to be concentrated or eliminated is extracted from solids, liquids or gases.

F

Foundation: The concrete slab forming the supporting base as well as the concrete walls of the mining structure.

G

Geotechnical study: Theoretical and applied evaluation of the physical and mechanical characteristics of soils and rock.

Guarantee: The proponent's legal and financial obligation to ensure the Government that money is available for rehabilitation work should the proponent fail to honour his commitments. See Chapter 13 for a description of the different types of guarantee.

Guarantee description: Document indicating the form the guarantee accompanying the rehabilitation plan will take; in keeping with eligible categories under the *Regulation respecting mineral substances other than petroleum, natural gas and brine (M-13.1, r.1).*

Guarantor: Person who signs an agreement with a third party agreeing to fulfil the obligations of a debtor.

H

Habitat: Ecosystem in which organisms, populations, species and groups of species live.

Hazardous waste: Material whose volume, concentration, composition, corrosive, inflammable, reactive, toxic, infectious, radio-active characteristics or any other factor constitute, separately or in combination with one or many other substances, a real or potential hazard to human health, public safety and welfare or to the environment if not stored, treated, transported, eliminated, used or otherwise managed; substances stipulated under the *Hazardous Waste Regulation.* Note: tailings are not considered hazardous waste under the *Environment Quality Act.*

Heavy machinery: Any mobile equipment which moves independently or can be moved by a motor vehicle and is not permanently fixed in the bedrock; includes rail trains, motor vehicles (automobiles, trucks, scoop trams, power shovels, bulldozers, etc.), drills on wheels, tracks, or skids, fork-lifts, etc.

Host rock: Term generally used to describe the rock that forms a wall supporting the deposit or ore zone.

I

Inactive mining site: Mining site no longer in operation.

L

Leachate: Liquid or filtrate that percolates through a given environment.

Levelling: Evening off land to make it compatible with the surrounding topography.

Lithology: Nature of the rocks composing a rock formation. Study of their composition, texture, cohesion, faults, structures, genesis and evolution.

Lodging buildings: See "Mining camp".

M

Man-induced erosion: Erosion resulting from human activity.

Mine: Any opening or excavation made for the purpose of searching for or mining mineral substances or operating an underground reservoir, including a well used to maintain water pressure, to dispose of or inject water or to create a water supply source, passageways, works, machinery, plants, buildings and furnaces below or above ground and forming part of a mining operation *(M-13.1, s. 218)*.

Mine water: Water pumped from a mining excavation to keep structures dry.

Mineral substances: Natural mineral substances in solid, gaseous or liquid form, except water, and fossilized organic matter *(M-13.1, s. 1)*.

Mining: Extracting, concentrating, smelting or refining mineral substances from a mining deposit.

Mining camp: Lodging buildings and facilities and related commodities.

Mining method: Technique used to extract ore from an underground or open-pit mine.

Mining operations: Activities aimed at increasing or mining mineral resources including prospecting, exploration, bulk sampling, ore extraction, ore processing and tailings processing.

Mining site: Any land that is or could be used for exploration or mining.

N

Natural flow: Pre-mining activity flow.

O

Openings: Shafts, chutes, adits, ramps, underground worksites with surface openings and all other means of access to underground structures.

Operator: Any person who, as owner, lessee or occupant of a mine or underground reservoir, performs or directs mining operations, or causes them to be performed or directed *(M-13.1, s. 218)*.

Ore: Rock mass containing valuable minerals in sufficient concentrations and volumes to justify mining.

Ore processing: Operation which consists in extracting marketable substances from ore, concentrate or tailings.

Ore reserves: Mineral reserves for an existing mining activity or for a deposit for which mining is being considered and is deemed profitable based on a feasibility study. (Ref. No. 18)

Organic soil: Soil rich in plant debris and products from decomposition. The organic component and structure is in large part due to vegetation content.

Overburden: Unproductive soil covering productive areas or bedrock.

P

Person: Individual, society, cooperative or corporation other than a municipality. Except where inconsistent with the statute or with the circumstances of the case, extends to heirs and legal representatives *(I-16, s. 61, p. 16)*.

Petroleum products: Includes fuel (gas, diesel and airplane fuel), combustibles (light and heavy heating oil), lubricants (new or used oils, greases). The following products are not considered petroleum products: liquefied gas (propane, natural gas, etc.), oils used in hydraulic and cooling systems, mineral and vegetable oils used to work metals and PCBs *(U-1.1, r.1)*.

Physical properties: Physical features that define material: colour, structure (capillary and noncapillary porosity), permeability of compacted soil, air and water content, compressibility, plasticity, cohesion, consistence, swell, capillarity, hardness, particle size, texture, porosity, etc.

Physiographic mark: Reference point easily found on plans, aerial photographs or on-site, i.e. river delta, mountain peak, etc.

Pile: See "Accumulation area".

Probable reserves: Mineral deposit whose continuity is assured and proven by drilling and sampling on a relatively large but regular mesh. Mesh density helps to establish volume, boundaries, mass, and grade accurately enough to plan preliminary mining. (Ref. No. 18)

Processing plant: Surface facilities used for upgrading ore, recovering metals or concentrating valuable minerals for smelting or any other type of reduction.

Proponent: Person who in his capacity as operator or mining title holder, submits a mining site rehabilitation plan.

Proven reserves: Mineral deposit whose volume, boundaries, mass, and grade are known in detail from drilling and sampling on close and regular meshes and from mining and systematic, specific and bulk sampling. Access to the ore and information is sufficient for making detailed mining plans. (Ref. No. 18)

R

Receiving environment: Natural aquatic or land ecosystem into which gases, liquids and solids from mining operations are emitted, discharged or deposited.

Reclamation: Reorganization of a former mining site for other purposes (i.e. recreational, industrial).

Recurrence: Period during which an event is likely to happen again.

Rehabilitation: Operation consisting of restoring a mining site to a satisfactory condition. In this document, the term rehabilitation includes reclamation.

Reserves: Mineral deposit for which a feasibility study has proven and established characteristics such as mass, grade, crystallography, size, limits, distribution and variability. Data is explicit enough to establish potential profitability.

The feasibility study must justify the investments needed to mine this deposit. (Ref. No. 18)

S

Safety: Implementation of the safety measures described in Chapter X of the Regulation *(M-13.1. r.1)* and techniques used to comply with the protective measures stipulated in Section 232 of the *Mining Act*.

Scarify: Break up the soil before harrowing.

Schedule: Time allocated for the various stages of work, a program of activities, actions, etc.

Sedimentation pond: Pond or basin for disposing of solid suspended material or processing sludge.

Service buildings: All buildings other than those used for mining, i.e. workshops, garages, warehouses, stores, powder magazines, gates, compressing rooms, generator rooms, etc.

Shutdown: Complete stoppage of mining activities under Section 232.1 of the *Mining Act* without any anticipated resumption of activities.

Slope: Any sloping area. Slopes of 10 to 40 , especially those located below a smaller slope, waste rock or backfill. Usually refers to unconsolidated deposits.

Sludge: Fine water-laden material resulting from effluent processing or mine drainage sedimentation.

Solid waste: Residual material that is solid at 20 C; solid waste incineration residues, domestic waste, debris, rubble or other waste that is solid at this temperature. *(Regulation respecting solid waste, Q-2, r. 3.2)*

Stratigraphic survey: A survey for defining a lithological correlation between various geological units, based on lithofacies, in order to determine the age of the deposit (in terms of geological history).

Structural survey: Modelling the relationship between major and minor structural units in terms of distortion affecting deposit location, i.e. faults, multiple intrusions, bench marks, folds or injections.

Support infrastructures: Any necessary structure needed for mining activities, including buildings, gas and water pipes, waterworks and sewer systems, telephone cables and reservoirs, either underground or on the surface.

Surface mineral substances: Peat, sand, gravel; igneous, metamorphic or sedimentary rock used as dimension stone or crushed stone; limestone and dolomite mined, among other purposes, for the preparation of industrial lime and the improvement of soils; sandstone and quartzite mined as silica ore; limestone, sandstone and argillaceous schist mined for the preparation of cement; common clay and argillaceous schist used for the making of clay products; inert tailings used for construction purposes *(M-13.1, r.1, s.1)*.

Surface pillars: Rock mass of variable geometry; may contain minerals or not; on top of underground excavations.

T

Tailings pond: Area where waste mineral substances and waters from ore processing are stored. Adjoining ponds are part of the tailings pond.

Tailings: Rejected mineral substances, sludge and water, except the final effluent, from extraction operations and ore treatment, and slag from pyrometallurgy operations. *(M-13.1, s. 1)*

Temporary shutdown: Complete stoppage of activities under Section 232.1. However, one or more of the activities is expected to resume within a specific time frame: generally less than six months.

Topsoil: Cover of organic material conducive to the growth of vegetation. Nitrogen, potassium and phosphate content must be well-balanced.

Transportation infrastructures: Systems and structures that constitute the transportation network, i.e. roads, railways, airports, bridges, culverts and ditches.

U

Unconsolidated deposits: Any mineral substance covering bedrock, excluding substances in accumulation areas.

W

Waste rock: Mined rock or natural rock containing insufficient minerals to be mining for profit.